SBIR

Small Business Innovation Research

FY 2007

NOAA Program Solicitation

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U.S. DEPARTMENT OF COMMERCE
http://www.oar.noaa.gov/ORTA/SBIR

TABLE OF CONTENTS

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

1.0 PROGRAM DESCRIPTION

1.1 Introduction

The Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA) invites small businesses to submit research proposals under this solicitation. Firms with strong research capabilities in any of the areas listed in Section 8 of this solicitation are encouraged to participate. **Unsolicited proposals are not accepted under the Small Business Innovation Research (SBIR) program.**

Objectives of this program include stimulating technological innovation in the private sector and strengthening the role of small business in meeting Federal research and development (R&D) needs. This program also seeks to increase the commercial application of innovations derived from Federal research and to foster and encourage participation by socially and economically disadvantaged and woman-owned small businesses. Also, in accordance with E.O. 13329, the NOAA SBIR program will give a high priority, where feasible, to proposals that are directed toward innovations that will aid the manufacturing sector of the Nation's economy.

1.2 Three-Phase Program

The "Small Business Innovation Research Program Reauthorization Act of 2000" requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to small business concerns for innovation research.

The funding vehicles for NOAA's SBIR program in both Phase I and Phase II are contracts. This document solicits Phase I proposals only.

NOAA has the unilateral right to select SBIR research topics and awardees in both Phase I and Phase II, and to award several or no contracts under a given subtopic.

1.2.1 Phase I – Feasibility Research

The purpose of Phase I is to determine the technical feasibility of the proposed research and the quality of performance of the small business concern receiving

an award. Therefore, the proposal should concentrate on research that will significantly contribute to proving the feasibility, a prerequisite to further support in Phase II.

1.2.2 Phase II – Research and Development

Only firms that are awarded Phase I contracts under this solicitation will be given the opportunity to submit a Phase II proposal immediately following completion of Phase I. Phase II is the R&D or prototype development phase. It will require a comprehensive proposal outlining the research in detail and a plan to commercialize the final product. NOAA may require delivery of the prototype. Each Phase II applicant will be required to provide information for the SBA Tech-Net Database System (http://tech-net.sba.gov) when advised this system can accept their input.

Further information regarding Phase II proposals and Tech-Net requirements will be provided to all firms receiving Phase I contracts.

1.2.3 Phase III – Commercialization

In Phase III, it is intended that non-SBIR capital be used by the small business to pursue commercial applications of Phase II.

1.3 Eligibility

Each organization submitting a proposal **must** qualify as a small business (Section 2.1) for research or R&D purposes (Section 2.2) at the time of the award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the research. More than one-half of the principal investigator's time must be spent with the small business for the period covered by the award. **Primary employment with a small business precludes full-time employment with another organization. The NOAA program manager in consultation with the contracting officer must approve deviation from these requirements.**

Also, for both Phase I and Phase II, the work must be performed in the United States. "United States" means the fifty states, the territories and possessions of the United States, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau. **The NOAA program Manager in consultation with the contracting officer may approve exceptions to this requirement.**

Joint ventures and limited partnerships are eligible, provided the entity created qualifies as a small business as defined in this solicitation. **Consultative arrangements between firms and universities or other non-profit**

organizations are encouraged, with the small business serving as the prime contractor.

1.4 Contact with NOAA

In the interest of competitive fairness, oral or written communication with NOAA or any of its components concerning additional information on the technical topics described in Section 8 of this solicitation **is prohibited**.

Requests for general information on the NOAA SBIR program may be addressed to:

Dr. Joseph M. Bishop, NOAA SBIR Program Manager
1335 East West Highway, SSMC1, Suite 106
Silver Spring, MD 20910 – 3284
Telephone: (301) 713-3565, Fax: (301) 713-4100
E-mail: joseph.bishop@noaa.gov

Additional scientific and technical information sources are listed in Section 7.

2.0 DEFINITIONS

2.1 Small Business Concern

A Small Business Concern is one that, at the time of award for Phase I and Phase II:

(a) is independently owned and operated, is organized for profit, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States (Section 1.3);

(b) is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of it's voting stock is owned by United States citizens or lawfully admitted permanent resident aliens; and

(c) has, including its affiliates, a number of employees not exceeding 500, and meets the other small business regulatory requirements found in 13 Code of Federal Regulations Part 121. Business concerns are affiliates of one another when, either directly or indirectly, (1) one concern controls or has the power to control the other, or (2) a third party controls both. Control can be exercised through common ownership, common management, and contractual relationships. Business concerns include, but are not limited to, any individual, partnership, joint venture, association, or cooperative.

2.2 Research or Research and Development

Any activity that is (a) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (b) as systematic study directed specifically toward applying new knowledge to meet a recognized need; or (c) a systematic application of knowledge toward the production of useful materials, devices, systems, or methods, and includes design, development, and improvement of prototypes and new processes to meet specific requirements.

In general, the NOAA SBIR program will fund Phase I and Phase II proposals with objectives that can be defined by (b) and (c) above.

2.3 Socially and Economically Disadvantaged Small Business Concern

Is one that is:

(a) at least 51 percent owned by (1) an American Indian tribe or a native Hawaiian organization, or (2) one or more socially and economically disadvantaged individuals, and

(b) controlled by one or more such individuals in its management and daily business operations.

A socially and economically disadvantaged individual is defined as a member of any of the following groups: Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, or any other individual found to be socially and economically disadvantaged by the Small Business Administration (SBA) pursuant to Section 8(a) of the Small Business Act, 15 U.S. Code (U.S.C.) 637(a).

2.4 Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control (meaning to exercise the power to make policy decisions) and operate (meaning being actively involved in the day-to-day management) the small business.

2.5 Funding Agreement

The funding vehicles for NOAA's SBIR program in Phase I and Phase II are Firm-Fixed-Price contracts.

2.6 Subcontract

This is any agreement, other than one involving an employer-employee relationship, entered into by the contractor, calling for supplies or services required solely for the performance of the original FFP contract.

2.7 Commercialization

This is locating or developing markets and producing and delivering products or services for sale (whether by the originating party or by others). As used here, commercialization includes both Government and private sector markets.

3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

3.1 Proposal Requirements

The objective is to provide sufficient information to demonstrate that the proposed work represents a sound approach to the investigation of an important scientific or engineering innovation. **The proposal must meet all the requirements of the subtopic in Section 8 to which it applies.** A proposal must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research in the subtopic area addressed by the proposal. **A proposal will not be deemed acceptable if it represents presently available technology.** Each proposal should be checked carefully by the offeror to ensure inclusion of all essential material needed for a complete evaluation. The proposal will be peer reviewed as a scientific paper. All units of measurement should be in the metric system.

NOAA reserves the right not to submit to technical review any proposal which has insufficient scientific and technical information, or one which fails to comply with the administrative procedures as outlined in the NOAA/SBIR Checklist in Section 10.

The proposal must not only be responsive to the specific NOAA program interests described in Section 8 of the solicitation, but also serve as the basis for technological innovation leading to **new commercial products, processes, or services.** An organization may submit different proposals on different subtopics or different proposals on the same subtopic under this solicitation. When the proposed innovation applies to more than one subtopic, the offeror must choose that subtopic which is most relevant to the offeror's technical concept.

Proposals principally for the commercialization of proven concepts or for market research must not be submitted for Phase I funding, since such efforts are considered the responsibility of the private sector.

The proposal should be direct, concise, and informative. Promotional and other material not related to the project shall be omitted. **The Phase I proposal must provide a description of potential commercial applications.**

3.2 Phase I Proposal Limitations

- Page Length - **no more than 25 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, any other enclosures or attachments, and the proposal summary budget.

- Paper Size - must be 21.6 cm X 27.9 cm (8 ½" X 11").

- Print Size - **must be easy to read with a fixed pitch font of 12 or fewer characters per inch or proportionally spaced font of point size 10 or larger with no more than six lines per inch. Margins should be at least 2.5cm.**

Supplementary material, revisions, substitutions, audio or videotapes, or computer floppy disks will **not** be accepted.

Proposals not meeting these requirements will be returned without review.

3.3 Phase I Proposal Format

3.3.1 Cover Sheet

Complete Section 9.1 "Cover Page" as page 1 of each copy of each proposal. **NO OTHER COVER WILL BE ACCEPTED.** Xerox copies are permitted.

3.3.2 Project Summary

Complete Section 9.2 "Project Summary" as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objective, and technical approach.

In summarizing anticipated results, include technical implications of the approach (for both Phase I and II) and the potential commercial applications of the research. **The Project Summary of the proposals that receive an award will be published by NOAA and, therefore, must not contain proprietary information.**

3.3.3 Technical Content

Beginning on page 3 of the proposal, include the following items with headings as shown:

(a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why it is important. Show how it applies to a specific subtopic in Section 8.

(b) **Phase I Technical Objectives.** State the specific objectives of the Phase I effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

(c) **Phase I Work Plan.** Include a detailed description of the Phase I R&D plan. The plan should indicate not only what will be done, but also where it will be done, and how the R&D will be carried out. The methods planned to achieve each objective or task should be discussed in detail. **This section should be at least one-third of the proposal.**

(d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal, including any conducted by the principal investigator or by the proposer's firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. **The purpose of this section is to persuade reviewers of the proposer's awareness of recent development in the specific topic area and assure them that the proposed research represents technology presently not available in the marketplace.**

(e) **Key Personnel and Bibliography of Related Work.** Identify key personnel involved in Phase I, including their related education, experience, and publications. Where resumes are extensive, summaries that focus on the most relevant experience and publications are suggested. List all other commitments that key personnel have during the proposed period of contract performance.

(f) **Relationship with Future R&D.** Discuss the significance of the Phase I effort in providing a foundation for the Phase II R&D effort. Also state the anticipated results of the proposed approach, if Phases I and II of the project are successful.

(g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities. The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase I.

(h) **Consultants and Subcontracts.** The purpose of this section is to convince NOAA that: (1) research assistance from outside the firm materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time the proposal is submitted.

Outside involvement in the project is encouraged where it strengthens the conduct of the research; such involvement is not a requirement of this solicitation.

1. Consultant – A person outside the firm, named in the proposal as contributing to the research, must provide a signed statement confirming his/her availability, role in the project, and agreed consulting rate for participation in the project. **This statement is part of the page count.**

2. Subcontract – Similarly, where a subcontract is involved in the research, the subcontracting institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed participation in the research, with its proposed budget for this participation. **This letter is part of the page count.**

(i) **Potential Commercial Applications and Follow-on Funding Commitment.** Describe in detail the commercial potential of the proposed research, how commercialization would be pursued, benefits over present products on the market, and potential use by the Federal Government.

(j) **Cooperative Research and Development Agreements (CRADA).** State if the applicant is a current CRADA partner with NOAA, or with any other Federal agency, naming the agency title of the CRADA, and any relationship with the proposed work.

(k) **Guest Researcher.** State if the applicant is a guest researcher at NOAA, naming the sponsoring laboratory.

(l) **Cost Sharing.** Cost participation could serve the mutual interest of NOAA and certain SBIR contractors by helping to assure the efficient use of available resources. Except where required by other statutes, NOAA does not encourage or require cost sharing on Phase I projects, nor will cost sharing be a consideration in evaluation of Phase I proposals.

3.4 Equivalent Proposals or Awards

A firm may have received other SBIR awards or elected to submit essentially equivalent proposals under other SBIR program solicitations. In these cases, a statement **must** follow the Technical Content section in the proposal indicating:

(a) the name and address of all agencies to which a proposal was submitted or from which an SBIR award was received;

(b) the date of proposal submission or date of award;

(c) the title, number, and date of the SBIR program solicitation under which a proposal was submitted or award received;

(d) the specific applicable research topic for each proposal submitted or award received

(e) the title of the research project; and

(f) the name and title of the principal investigator for each proposal submitted or award received.

If no equivalent proposal is under consideration or equivalent award received, a statement to that effect **must** be included in this section.

3.5 Prior SBIR Phase II Awards

If a small business concern has received one or more Phase II awards from any of the Federal agencies in the prior five fiscal years, it must submit on a separate page, the names of awarding agencies, dates of awards, funding agreement numbers, amounts, topic or subtopic titles, follow-on agreement amounts, sources and dates of commitments, and current commercialization status for each Phase II. **This required information shall not be part of the page count limitation.**

3.6 Proposed Budget

Complete the "NOAA/SBIR Proposal Summary Budget" (Section 9.3) for the Phase I effort, and include it as the last page of the proposal. Some items on this form may not apply. Enough information should be provided to allow NOAA to understand how the offeror plans to perform if the contract is awarded. A complete cost breakdown should be provided giving labor rates, proposed number of hours, overhead, G&A, and profit. A reasonable profit will be allowed. When proposing travel, identify the number of trips, people involved, labor

categories, destination of travel, duration of trip, commercial airfare or mileage rate, per diem expenses, and purpose of travel. Budgets for travel funds must be justified and related to the needs of the project. Where equipment is to be purchased, list each individual item with the corresponding cost. The inclusion of equipment will be carefully reviewed relative to need and appropriateness. Equipment is defined as an article of nonexpendable, tangible property having a useful life of more than one year and an acquisition cost of $5,000 or more per unit.

SBA Policy requires that NOAA not issue SBIR awards that include provisions for subcontracting any portion of the contract back to the originating agency or any other Federal Government agency or to other units of the Federal Government. Requests for waivers from this requirement must be sent to the NOAA program manager.

For Phase I, the proposing firm must perform a minimum of two-thirds of the research and/or analytical effort. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract price. For Phase II, the proposing firm must perform one-half of the research and/or analytical effort.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

All Phase I and II proposals will be evaluated on a competitive basis. Each Phase I proposal will be evaluated by NOAA to ensure that it meets the administrative requirements outlined in Section 4.2. Proposals that meet these requirements will be peer reviewed, undergo competitive review within each laboratory, and may also undergo a third round of competitive review across the agency.

4.2 Phase I Evaluation Criteria

To avoid a misunderstanding, small businesses are cautioned that Phase I proposals not satisfying all the evaluation criteria shall be returned without peer review and eliminated from consideration for a contract. Proposals may not be resubmitted (with or without revisions) under this solicitation. All copies of proposals that fail the evaluation process will be returned. The evaluation criteria are:

(a) The proposing firm must qualify as a small business (Section 2.1). If it is a subsidiary of another firm, this limit applies to all employees under control of the parent organization.

(b) The Phase I proposal must meet **all** of the requirements stated in Section 3.

(c) The Phase I proposal must be limited to one subtopic and clearly address research for that subtopic.

(d) **Phase I proposal budgets must not exceed $95,000.**

(e) **The project duration for the Phase I research must not exceed six months.**

(f) The proposing firm must carry out a minimum of two-thirds of expenditures under each Phase I project.

(g) The proposal must contain information sufficient to be peer reviewed as a research contract.

4.3 Phase I Evaluation and Selection Criteria

Phase I proposals will be rated by NOAA and/or external scientists or engineers with equal consideration given to the following criteria, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit of the Phase I research plan and its relevance to the objectives, with special emphasis on its innovativeness and originality.

(b) Importance of the problem or opportunity and anticipated benefits of the proposed research to NOAA, and the commercial potential, if successful.

(c) How well the research objectives, if achieved, establish the feasibility of the proposed concept and justify a Phase II effort.

(d) Qualifications of the principal investigator(s), other key staff, and consultants, and the probable adequacy of available or obtainable instrumentation and facilities.

Reviewers will base their ratings on information contained in the proposal. It cannot be assumed that reviewers are acquainted with any experiments referred to, key individuals and facilities.

Final award decisions will be made by NOAA based upon ratings assigned by reviewers and consideration of additional factors, **including possible duplication of other research**, the importance of the proposed research as it relates to NOAA needs, and the availability of funding. NOAA may elect to fund

several or none of the proposals received on a given subtopic. Approximately one-third of subtopic areas are generally funded in this solicitation. Upon selection of a proposal for a Phase I award, NOAA reserves the right to negotiate the amount of the award.

4.4 Phase II Evaluation and Selection Criteria

The Phase II proposal will undergo NOAA and external peer review for the purpose of determining overall technical or scientific merit. Review panels, composed of senior technical specialists, will make the final Phase II selection decision based on the written reviews and the company presentation to the panel. Each of the following evaluation criteria will receive approximately equal weight, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit with emphasis on innovation and originality.

(b) Degree to which the Phase I objectives were met.

(c) The commercial potential of the proposal as evidenced by: 1) a record of commercialization, 2) the existence of Phase II funding commitments from non-SBIR sources, 3) existence of Phase III follow-on commitments, and 4) the presence of other indications of commercial potential of the research.

(d) The adequacy of the Phase II objectives to meet the problem or opportunity.

(e) The qualifications of the principal investigator and other key personnel to carry out the proposed work.

Upon selection of a proposal for Phase II award, NOAA reserves the right to negotiate the amount of the award. NOAA is not obligated to fund any specific Phase II proposal.

4.5 Release of Proposal Review Information

After final award decisions have been announced, the technical evaluations of a proposal will be provided to the proposer only upon written request and for a period not to exceed 90 days. The identity of the reviewers will not be disclosed.

5.0 CONSIDERATIONS

5.1 Awards

Contingent upon availability of funds, NOAA anticipates making about **16** Phase I firm-fixed-price contracts of no more than **$95,000** each. Performance period, with no exception, shall be no more than six months. Historically, NOAA has funded about ten percent of the Phase I proposals submitted which is approximately one-third of the subtopic areas.

Phase II awards shall be for no more than 400,000 (except for subtopics with the suffix "SG", which are limited to $300,000). The period of performance in Phase II will depend upon the scope of the research, but should not normally exceed 24 months.

It is anticipated that **approximately one-third of the Phase I awardees will receive Phase II awards**, depending upon the availability of funds. To provide for an in-depth review of the Phase I final report and the Phase II proposal and commercialization plan, Phase II awards will be made approximately seven months after the completion of Phase I.

For planning purposes, proposers should understand that Phase I awards are made in July, Phase II proposals are due the following February, and Phase II awards are made during August and September.

This solicitation does not obligate NOAA to make any awards under either Phase I or Phase II. Furthermore, NOAA is not responsible for any monies expended by the proposer before award of any contract resulting from this solicitation.

5.2 Reports

Six copies of a final report on the Phase I project shall be submitted to NOAA upon completion of the Phase I research. The final report shall include a single-page project summary as the first page, identifying the purpose of the research, and giving a brief description of the research carried out, the research findings or results, and the commercial applications of the research in a final paragraph. The remainder of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility.

All final reports must carry an acknowledgement on the cover page such as: "This material is based upon work supported by the Department of Commerce under contract number _____. Any opinions, findings, conclusions or

recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Department of Commerce."

Progress reports in a brief letter format will be required also.

5.3 Payment Schedule

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase I or Phase II contractor.

5.4 Proprietary Information, Inventions, and Patents

5.4.1 Limited Rights in Information and Data

Information contained in unsuccessful proposals will remain the property of the proposer, except that the "Project Summary" page may be made available to a limited audience through the SBA Tech-Net System. The Government may, however, retain copies of all proposals. Any proposal, which is funded, will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information is discouraged unless it is absolutely necessary for the proper evaluation of the proposal.

Proprietary information submitted to NOAA will be treated in confidence, to the extent permitted by law, if it is confined to a separate page with a numbering system key, and marked with a legend reading: "Following is proprietary information which (name of proposing firm) requests not be released to persons outside the Government, except for purposes of evaluation."

Any other legend will be unacceptable to NOAA and may constitute grounds for return of the proposal without further consideration. Without assuming any liability for inadvertent disclosure, NOAA will limit dissemination of such information to its employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Since technical reports may eventually be made available to the public, such reports shall not contain any language limiting their use other than for SBIR data as described below.

5.4.2 Copyrights

The contractor may normally establish claim to copyright any written material first produced in the performance of an SBIR contract. If a claim to copyright is made, the contractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 an acknowledgment of Government sponsorship (including contract

number) to the material when delivered to the Government, as well as when the written material or data are published or deposited for registration as a published work in the U.S. Copyright Office. For other than computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

For computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all such computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

5.4.3 Data Rights

Except for copyrighted data, the Government shall normally have unlimited rights to data in Phase I, II, or III awards, such as:

(a) data specifically identified in the SBIR contract to be delivered without restriction;

(b) form, fit, and function data delivered under the contract;

(c) data delivered under the contract that constitute manuals or instructions and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the contract; and

(d) all other data delivered under the contract.

According to Federal Acquisition Regulation 52.227-20, Rights and Data – SBIR Program (March 1994), the contractor is authorized to affix the following "SBIR Rights Notice" to SBIR data delivered under the contract:

SBIR RIGHTS NOTICE

These SBIR data are furnished with SBIR rights under Contract No. _____ (and subcontract _____, if appropriate). For a period of four years after acceptance of all items to be delivered under this contract, the Government agrees to use these data for Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the contractor, except that, subject to the forgoing use and use by support contractors. After the aforesaid four-year period, the Government has a royalty-free license to use, and to authorize

others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use.

(END OF NOTICE)

The Government's sole obligation with respect to any properly identified SBIR data shall be as set forth in the paragraph above. The four-year period of protection applies for Phases I, II, and III.

5.4.4 Patents

Small business firms normally may retain the worldwide patent rights to any invention made with NOAA support. As described in more detail in FAR 52.227-11, NOAA receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must substantially manufacture it domestically. To the extent authorized by 35 U.S.C. 205, NOAA will not make public any information disclosing a NOAA-supported invention to allow the contractor a reasonable time to pursue a patent (less than four years). SBIR awardees must report inventions that are planned to be patented to the NOAA SBIR Program Manager.

5.5 Awardee Commitments

Upon the award of a contract, the contractor will be required to make certain legal commitments. The outline that follows illustrates the types of clauses to which the contractor would be committed. This list is not a complete list of clauses to be included in Phase I funding agreements, and is not the specific wording of such clauses. Copies of complete terms and conditions are available upon request.

(a) Standards of Work. Work performed under the contract must conform to high professional standards.

(b) Inspection of Work. Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.

(c) Examination of Records. The Comptroller General (or a duly authorized representative) shall have the right to examine pertinent records of the contractor involving transactions related to this contract.

(d) Default. The Government may terminate the agreement if the contractor fails to perform the work contracted.

(e) Termination for Convenience. The Government may terminate the contract at any time if it deems termination to be in the best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

(f) Disputes. Any dispute about the contract, which cannot be resolved by agreement, shall be decided by the Contracting Officer with right to appeal.

(g) Contract Work Hours. The contractor cannot require an employee to work more than eight hours a day or 40 hours a week, unless the employee is compensated accordingly (i.e., received overtime pay).

(h) Equal Opportunity. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(i) Affirmative Action for Veterans. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

(j) Affirmative Action for the Handicapped. The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

(k) Officials Not to Benefit. No Government official shall benefit personally from any SBIR contract.

(l) Covenant Against Contingent Fees. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation, except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.

(m) Gratuities. The Government may terminate the contract if any gratuity has been offered to any representative of the Government to secure the contract.

(n) Patent Infringement. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.

(o) American-Made Equipment and Products. When purchasing either equipment or a product with funds provided through the contract, purchase only American-made equipment and products to the

extent possible, in keeping with the overall research needs of the project.

5.6 Additional Information

(a) Projects. The responsibility for the performance of the principal investigator, and other employees or consultants, who carry out the proposed work, lies with the management of the organization receiving an award.

(b) Organizational Information. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

(c) **Duplicate Awards. If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**

(d) **It is recommended that upon submission of your proposal you obtain a Dunn and Bradstreet Number. You will need this number to be eligible to receive an award. You can obtain this number free of charge by contacting Dunn and Bradstreet by phone at 1-800-333-0505 or on-line at http://www.dnb.com/US/duns_update/index.html. In addition, all award winners will be required to fill-out on-line forms located at: http://www.ccr.gov/ and http://orca.bpn.gov/. It is required that these forms be filled out upon submission of the proposal. Within these forms please pay special attention to filling out the data required in the North American Industry Classification System (NAICS) and the Federal Supply Classification (FSC) portions of the forms. This will greatly expedite the contract award process.**

This program solicitation is intended for information purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

5.7 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects

Any proposal that includes research involving human subjects, human tissue, data or recordings involving human subjects must meet the requirements of the

Common Rule for the Protection of Human Subjects, codified for the Department of Commerce at 15 CFR Part 27. Any questions regarding these requirements should be addressed to Dr. Joseph M. Bishop. Telephone: 301-713-3565 or e-mail: joseph.bishop@noaa.gov.

5.8 Research Projects Involving Vertebrate Animals

Any proposal that includes research involving vertebrate animals (including fish) must be in compliance with the National Research Council's "Guide for the Care and Use of Laboratory Animals" which can be obtained from National Academy Press, 2101 Constitution Avenue, NW, Washington, D.C. 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. 2131 et seq.), 9 CFR Parts 1, 2, and 3, and if appropriate, 21 CFR Part 58. These regulations do not apply to proposed research using pre-existing images of animals or to research plants that **do not** include live animals that are being cared for, euthanized, or used by the project participants to accomplish research goals, teaching, or testing. These regulations also do not apply to obtaining animal materials from commercial processors of animal products or to animal cell lines or tissues from tissue banks.

6.0 SUBMISSION OF PROPOSALS

6.1 Deadline for Proposals

Deadline for Phase I proposal receipt (six copies) at the Contract Administration Branch is 4:00 p.m. (EST) on January 17, 2007.

NOAA assumes no responsibility for evaluating proposals received after the stated deadline or that do not adhere to the other requirements of this solicitation (see 10.0 NOAA/SBIR Checklist). Such proposals may be returned to the proposer without review.

Federal Acquisition Regulation (FAR 52.215-1) regarding late proposals shall apply.

Letters of instruction will be sent to those eligible to submit Phase II proposals. The Phase II proposals are due after receipt of the Phase I Final Report, approximately seven months after commencement of the Phase I contract.

Proposers are cautioned of unforeseen delays that can cause late arrival of proposals at NOAA, resulting in them not being included in the evaluation procedures. No information on the status of proposals under scientific/technical evaluation will be available until formal notification is made.

6.2 Proposal Submission

Hardcopy submission of NOAA proposals should be sent in six copies to:

ATTN: SBIR Proposals
U.S. Department of Commerce, NOAA
Contract Administration Branch, Code OFA 65
1305 East-West Highway, SSMC4, #7146
Silver Spring MD 20910
Telephone: 301-713-0820 x 126

For local delivery, the Contract Administration Branch is located near the intersection of East-West Highway and Colesville Road, and close to the Silver Spring Metro.

Acknowledgment of receipt of a proposal by NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified in the acknowledgment.

(a) **Packaging: Secure packaging is mandatory. NOAA cannot process proposals damaged in transit. All six copies of the proposal must be sent in the same package. Do not send separate "information copies," or several packages containing parts of a single proposal, or two packages of six copies of the same proposal. The top copy must be signed as an original by the principal investigator and the corporate official. Other copies may be photocopies.**

(b) **Bindings: <u>Do not use special bindings or covers</u>**. Staple the pages in the upper left hand corner of each proposal. Separation or loss of proposal pages cannot be the responsibility of NOAA.

6.3 Warning

While it is permissible, with proper notification to NOAA, to submit identical or essentially equivalent proposals for consideration under numerous Federal program solicitations, it is unlawful to enter into contracts requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

7.0 SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

7.1 General Information

The following web pages may be sources for additional technical information:

http://www.noaa.gov http://www.lib.noaa.gov

7.2 Oceanography and Marine Science

Scientific information in the areas of oceanography and marine science may be obtained from organizations shown in the website
http://www.nsgo.seagrant.org/SGDirectors.html

8.1 TOPIC: ECOSYSTEMS

8.1.1 F-E Subtopic: Integrated System for Measuring Demersal Fish Habitats

Considerable effort and expense are being directed toward advanced acoustic mapping of the continental shelf seafloor (e.g., NOAA 2004). However, acoustic mapping alone cannot measure all factors that determine habitat quality. Similar efforts are needed to determine and understand habitat quality variables related to fisheries productivity. Sediment quality is a critical issue. Sediments are the repositories of organic material that fuel benthic and demersal food webs. Solar energy fixed by primary production at the sea surface that becomes tissue in important commercial fish species passes through the food web. To date, assessment of sediment quality on a scale comparable with that of acoustic mapping has been a logistical impossibility; far too time-consuming and labor-intensive. In light of this difficulty and the pressing need to determine habitat quality, the development of an in situ package that will quantify sediment biogeochemistry components is critical to ecosystem-based fisheries management. The required system, attached to trawl doors as they skim the seabed would measure ambient and re-suspended material from soft sediment during trawling operations aboard commercial and research fishing vessels. Material re-suspended by the passage of trawl doors provides an opportunity to examine the fisheries stoichiometry of near-bottom and surface sediment layers, specifically, nutrients, organic matter, sulfide, oxygen, and other biogeochemicals. Suspended particles could be determined by standard turbidity techniques (e.g., Standard Methods 1998; Gardner et al. 1990). Inorganic nitrogen and phosphorus (ambient and released from the sediment) which are essential for fisheries' protein production could readily be measured by existing methods. An index of labile organic matter from recent algal deposition could be detected by fluorometer (e.g., D'Sa et al. 1997). Cutting edge grain size instrumentation and ruggedized electrochemical electrodes would likely be incorporated. A useful system would require a means of measuring and correcting for ambient concentrations of analytes in very near bottom water. Measurement of actual labile organic matter (e.g., Mayer et al. 1995) is not envisaged. The proposed system should be deployable on cooperating commercial trawlers (with operator/observer) with data access upon retrieval. Fisheries research vessels capable of multibeaming while trawling presents the opportunity to fully calibrate the system in acoustically well-characterized sediments at hundreds of shelf sites per year. This calibration would allow data from systems aboard all fishing vessels to be integrated with acoustic reflectivity and other data to produce habitat maps.

References:

D'Sa, E., S. Lohrenz, V. Asper, and R. Walters. 1997. Time series measurements of chlorophyll fluorescence in the oceanic bottom boundary

layer with a multisensor fiber-optic fluorometer. J Atm Ocean Tech 14: 889-896.

Gardner, W.D., M.J. Richardson, I.D. Walsh, and B.L. Berglund. "In-situ optical sensing of particles for determination of oceanic processes: what satellites can't see, but transmissometers can." Oceanography 3, 11-17, (1990).

Mayer, L. M., L. L. Schick, T. Sawyer, C. J. Plante, P. A. Jumars, and R. L. Self. 1995. Bioavalilable amino acids in sediments: A biomimetic, kinetics-based approach. Limnol. Oceanogr. 40:511-520.

NOAA 2004. The Gulf of Maine Mapping Initiative. Coastal Services, Volume 7, Issue 2, March/April, NOAA Coastal Services Center, Charleston, SC 29405.

Standard Methods for the Examination of Water and Wastewater, 20th Edition. Clesceri, L. S., A. E. Greenberg and A. E. Eaton. 1998. Method 2130 B. (Turbidity-Nephelometric Method).

8.1.2 F-E Subtopic: Field Device for Molecular Determination of Fish Species/Stock Identification.

Identification of marine fish species is important in fish abundance surveys for studies of marine ecosystem function and stock assessment of commercially important species. Identification of fish species is usually performed by examining morphological characteristics of the captured fish and comparing these with key indicators. Accurate species identification requires substantial training and experience of personnel. Identification of fish in early life stages is especially challenging for closely related species because cryptic eggs and larva of closely related species lack morphologically distinguishing features. There is a clear need for biosensor technology for identification of fish species and stock. Identification of fish species and stock structure has been advanced by such molecular approaches as analysis of microsatellites, single nucleotide polymorphisms (SNPs), and mitochondrial genes among other molecular characteristics. These techniques can be applied to fish tissues, eggs and larva to enable studies of fish life history characteristicils, marine ecosystem function, fisheries management and seafood forensics. Molecular techniques for species and stock identification are typically laboratory based, slow and expensive. There is a clear need for portable instrumentation that can be used in the field, including aboard ships. An ideal technique should be relatively inexpensive (less than $1/sample), rapid (less than one hour), specific (90% or better), sensitive (100 cells or less), and accurate (80-90%). We request a Phase I study that might demonstrate the feasibility of a device for fish species identification and operational characteristics. The design of the device may include gene detection with or without amplification, and electrochemical sensing, among other possibilities.

References:

Hyde, J.R., E. Lynn, R. Humphreys Jr, M. Musyl, A.P. West and R. Vetter. 2005. Shipboard identification of fish eggs and larvae by multiplex PCR, and description of fertilized eggs of blue marlin, shortbill spearfish, and wahoo. Mar. Ecol. Prog. Ser. 286:269-277.

8.1.3 F-E Subtopic: Archival Tag for a Wide Range of Migratory Marine Animal Sizes

Successful management of marine animals, including highly migratory species and coastal pelagics, requires an understanding of their distribution, abundance, and habitat for each of the life stages. This information is essential for assessment, and an ecosystem based approach to management. Understanding the ecosystem and which selective portions of the ecosystem provide the habitat for individual life history stages of migratory marine animals can make assessment and modeling more accurate. It is also an essential element in the fisheries managers' decisions to choose appropriate techniques to monitor the stock and appropriately limit mortality throughout the life history of the animal. These data can be collected through the use of archival tagging programs (Metcalfe, J.D., and Arnold, G.P. 1997). Implantable archival tags, pop-off archival tags (PAT), and pop-off satellite archival tags (PSAT) have been developed over the past ten years, but are expensive and rather large, limited in the parameters they can collect, have restricted data storage, and pop-off attachment/release mechanisms currently limit time at liberty to less than one year (Block, B.A. et. al. 2001, Boehlert, G.W. et. al. 2001). Implantable archival tags have demonstrated multiple years at liberty, but recovery of the fish is necessary to collect the data. The tag size limits application to large animals, either large species or only the largest adult sizes of smaller species. Pressure within deep water habitats creates problems for archival tags, making them less reliable. Current geolocation mechanisms in subsurface ecosystems using light provide wide estimates of latitude and longitude (Teo, et. al. 2002). An archival tag capable of collecting data from a wide range of migratory marine animal sizes in both surface and deep water environments is required. We request a Phase I study that would demonstrate the feasibility of manufacturing a small, 20-30 grams about 50mm long, consistently reliable archival tag with innovative geolocation mechanism, and variety of ocean sensors, in an inert casing. This tag mechanism could be utilized as an implantable, PAT, and PSAT. Ocean sensors should measure at a minimum; pressure (2-3 meter accuracy in deep ocean), internal and external temperatures (20-50 Celsius), light (acceptable band with and response range for accurate geolocation), and time with factors to compensate for clock drift. The tag should be PC compatible, with a sturdy communications port to withstand field use over a 5 year period, with software to set observation timing, preset durations for pop-off, calibration and analysis software, and good documentation for programming and trouble-shooting. Target price at operational production should be less than $1000, preferably $600-$800.

Block, B.A., Dewar, H., Blackwell, S.B., Williams, T., Prince, E., Boustany, A.M., Farwell, C., Fudge, D.J. and Seitz, A. 2001. Migratory movements, depth preferences and thermal biology of Atlantic bluefin tuna. Science 293:1310-1314.

Boehlert, G.W., Costa, D.P., Crocker, D.E., Green, P., O'Brien, T., Levitus,S., and Le Boeuf, B.J. 2001. Autonomous Pinniped Environmental Samplers (APES): Using Instrumented Animals as Oceanographic Data Collectors. Journal of Atmospheric and Oceanic Technology 18:1882-1293.

Metcalfe, J.D., and Arnold, G. P. 1997. Tracking fish with electronic tags. Nature 38:665-666.

Teo, S.L., Blackwell, S., Boustany, A., Walli, A., Weng, K., Holts, D. and B.A. Block. 2002. Calibration of geolocation: A direct comparison of satellite and light-based geolocation technology. Mar. Ecol. Prog. Ser. 283:81-98.

8.1.4 N-E Subtopic: Autonomous Water Quality Profiling System for Coastal Observation Stations

The increasing degradation of water quality in bays, ports and harbors, coastal waters and the Great Lakes often causes large scale algae bloom, oxygen depletion, and significant changes in salinity, temperature, turbidity, etc. These often result in massive fish kills, shellfish bed closures, diseases in fish, and pose risks to human health. Most of the NOS National Water Level Observation Network (NWLON) and Physical Oceanographic Real-Time System (PORTS) stations are located at the mouth of rivers and bays or along the shore where materials such as sediments, nutrients, and contaminants from major watersheds accumulate. These stations are sheltered, secured, and equipped with operational multi-sensor data collection platform (DCP) and real-time data telemetry system. However, except for single point CTD measurements at limited stations, no water quality monitoring systems are installed at these stations. A major reason for this deficiency is marine biofouling that renders the water quality sensors unsuitable for long-term unattended operation. The two alternative water profiling approaches presently available to researchers, a water pumping system and a simple winch system, improve the situation but still have their limitations. The former collects water samples from one depth and the underwater pump is difficulty to maintain, and the latter still requires frequent service of underwater sensors.

An automated, long-term water quality profiling system is sought. Water quality data will be integrated into the NWLON and PORTS DCP's for collection, processing and dissemination. It should be capable of performing automated water quality measurements over a year-long service period (with yearly service checks) along the vertical water column at user defined depths, sampling intervals and duration, profiling speed, and measurement parameters. The

system operation commands should also include automated shutdown and restart. The multi-parameter water quality sensor head will be parked in a clean solution bath (such as acidified water, tap water, and chlorination if needed) with an automated self-cleaning mechanism (such as wiper or washing) inside the station shelter during non-profiling mode. The system should be designed to allow easy installation and replacement of water quality sensors. This development work will focus on the design of automated robotic profiling and sensor cleaning mechanisms, and system integration with a commercially available reputable water quality instrument (such as YSI 6600 or other multi-parameter instrument). A minimum of five parameters including temperature, depth, conductivity, dissolved oxygen and chlorophyll or nutrient shall be adequate for the system demonstration. However, the DCP should be designed to allow for future addition of other water quality parameters. Functions of automated profiling, data collection and sensor cleaning should be demonstrated. The proposed system is to address the needs for monitoring inputs from land called by the U.S. Integrated Ocean Observing System program. It will support NOS National Estuarine Research Reserve System (NERRS), HAB, and other coastal water quality observation programs.

References:

Dunne, J.P., Devol, A.H., and Emerson, S., 2002. "The Oceanic Remote Chemical/Optical Analyzer (ORCA) – An Autonomous Moored Profiler, J. Atmospheric and Oceanic Tech., 19 (2), 1709-1721.

NOAA NWLON and PORTS Network. http://www.tidesandcurrents.noaa.gov

NOAA NERRS system-wide Monitoring Program. http://nerrs.noaa.gov/Monitoring

NOPP, 2005. First Annual Integrated Ocean Observing System (IOOS) Development Plan: The National Office for Integrated and Sustained Ocean Observations, Ocean.US Publication No. 9. http://www.ocean.US/documents/docs/IOOSPlan-FIN_04-15-05.pdf

8.1.5 N-E Subtopic: In-situ Multi-Spectral Imaging Device for Coral Disease Detection

This solicitation seeks the development of a prototype underwater field-instrument that is self-contained and has remotely controllable elements, e.g., light excitation source, selectable filter components, multi-spectral imaging system, and mini-computer (capable of collecting data, processing data using neural network type analyses, and providing readout in field compatible format). The prototype would be a SCUBA diver-controllable underwater field-based multi-spectral imaging device that can characterize all wavelengths between 360-920nm. The instrument should be able to capture, simultaneously, the entire

fluorescent spectra of characteristic coral fluorescent protein profiles /in-situ /and use them as indicators of a given health status to determine the individual colony and overall health status of specific coral reefs. A successful applicant would, when prototype is built, test the prototype in laboratory and field settings; and be able refine the design to meet specific needs of measuring individual coral colony fluorescence in the underwater coral reef environment.

References:

Sutherland, K. P., J. W. Porter, et al. (2004). "Disease and immunity in Caribbean and Indo-Pacific zooxanthellate corals." Marine Ecology Progress Series 266: 273-302.

Waddell, J. E. (2005). The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. Dept. of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NOS NCCOS 11: 522.

Reference to coral fluorescence changes under stress:

Zawada DG and JS Jaffe (2003). Changes in the fluorescence of the Caribbean coral Montastraea faveolata during heat-induced bleaching. Limnology and Oceanography 48 (1): 412-425.

8.1.6 F-E Subtopic: Microsensors for Marine Chemical and Microbial Measurements

The end purpose of this feasibility research is to develop a prototype marine instrument deployable on fixed, towed or autonomous platforms capable of providing chemical compound or microbial identification and quantification. Identifying and quantifying microbes and the chemical compounds that make up marine nutrients and contaminants currently requires time consuming and costly field sample collection and laboratory analyses. Microsensors manufactured with techniques derived from the integrated circuit industry represent an opportunity to develop next-generation marine sensors with improved measurement capabilities at lower cost. Technologies such as quartz crystal microbalance, surface acoustic-wave, and silicon integrated circuit structures can be applied in the marine environment to allow direct extraction of data in the field or to provide survey information during field sampling efforts. These technologies do not employ colorimetric measurement requiring chemical reagents. Instrumentation utilizing this technology will be applicable to marine environmental research, environmental monitoring and municipal drinking water quality assessment.

Contaminants and nutrients of interest along with detection goals:

	Range	Resolution
Persistent Organic Contaminants	0-1 ppm	1 ppt
Phosphate	0.5-3.0 ug P/L	0.1 ug P/L
Silica	0.1-2.0 mg SiO2/L	0.1 mg SiO2/L
Dissolved Oxygen	0-12 mg/L	0.01 mg/L
Nitrate-nitrogen (NO3)	0.01-.5 mg N/L	0.01 mg N/L
Ammonium-nitrogen (NH4)	5-50 ug N/L	1.0 ug N/L
Chloride	10-50 ug Cl/L	1.0 ug Cl/L

8.1.7 F-E Subtopic: In-Field Sensors for Detection of Microbial Contaminants in Coastal Waters

Microbial contamination adversely impacts coastal water quality, and poor water quality has negative economic, health, and environmental impacts. In order to support an ecosystems approach to understanding the relationships between humans, ocean processes, marine ecosystem health, and human health outcomes and to facilitate ecological forecasting, the development and implementation of rapid and automated methods for monitoring and identifying microbial contamination in coastal waters is needed. Proposals are requested to test the feasibility of the development of sensors for biological observing systems. Designs may couple marine biotechnology and engineering approaches to enable field portable and in-situ biosensors that allow rapid enumeration of indicators of fecal pollution and detection of source tracking markers and/or human pathogens. Integrated mechanical, electrical, fluidic, and molecular biological innovations are needed in order to efficiently filter large volumes of water, process and detect microbes (viable or nucleic acids) with minimal to no human interaction, and to meet size, power, and cost requirements. To enable validation of ecological forecasting models and to support coastal management decisions, design and testing of portable or in-situ sensors should include the capacity to integrate biological data with physical and climatological data generated from automated platforms.

References:

Clark, J.S., et al. 2001. Ecological Forecasts: An Emerging Imperative, Science, 293, 657-660.

http://ocean.us/

Noble, R.T., and Weisber, S.B. 2005. A review of technologies for rapid detection of bacteria in recreational waters. Journal of Water and Health, 4, 381-392.

8.1.8 SG-E Subtopic: Aquaculture: Developing and Improving Species Culture

Proposals are requested for research, which offers to make significant, industry-wide improvements in finfish, shellfish, and ornamental species systems for both small scale and large-scale applications, including gaining access to harvest areas and growing areas through improved monitoring and through processing techniques. Priority will be given to research, which finds innovative approaches that will solve major industry bottlenecks in an economically and environmentally compatible manner. Research aimed at new species for culture and research to adapt techniques being used successfully in other countries is appropriate.

8.1.9 SG-E Subtopic: Aquaculture: Water Reuse and Effluent Treatment Systems

Proposals are requested for developing integrated aquaculture systems with minimum impact on the environment. These include development of innovative water reuse systems for ponds and raceways and other novel systems for treating effluent. Special priority will be given to prototype, modular water reuse systems suitable for producing a variety of species anywhere in the United States.

8.1.10 SG-E Subtopic: Aquaculture: Culture of Marine organisms for Marine Natural Products

Research in the past two decades has found that there are many marine organisms which produce novel natural products of use in treating human diseases. To utilize these products commercially and in clinical trials, however, they need either to be chemically synthesized, produced using biotechnology, or produced through aquaculture of organisms. Research is needed to find economically cost-effective and biologically viable ways to culture marine organisms specifically for their production of novel natural products.

8.1.11 SG-E Subtopic: Aquaculture: Open Ocean Aquaculture

Both engineering and biological technology needs to be explored for the development of open-ocean or offshore culture systems. Large scale, offshore, submersible and floating systems need to be developed for Atlantic, Gulf of Mexico and Pacific conditions. Automatic feeding and harvesting functions, predator control systems, as well as telemetry and remote control systems will be

considered in this competition. The biological technology would include hatchery, nursery, and transport systems for candidate species for open-ocean aquaculture. Field tests of candidate species are encouraged.

8.1.12 SG-E Subtopic: Aquaculture: Disease Diagnostics and Control

Given the severe problems with aquaculture disease diagnostics and controls, we seek proposals in those areas aimed at reducing negative impacts on the U.S. aquaculture industry.

8.1.13 SG-E Subtopic: Aquaculture: Improved Diet Formulations

Projects are being sought to develop improved diets for marine species that are lower in fishmeal content while maintaining a beneficial level of Omega 3 fatty acids and economic competitiveness. Projects that develop technologies for reducing any feed contaminants such as PCBs, pesticides and herbicides are also appropriate under this topic.

8.1.14 SG-E Subtopic: Aquaculture: Mechanization of Underwater Tasks Related to Aquaculture and the Harvest of Shellfish and Macro-algae

Significant progress has been made in the development of robotic tools for a variety of underwater tasks in marine science, defense, and certain industrial activities. These tools allow for the reduced human presence in hazardous situations or for doing tasks that are too deep, too difficult, or simply monotonous. The use of scuba divers for underwater tasks related to marine resources may represent areas where these mechanized or robotic techniques have application. The purpose of this topic is to identify and develop innovative robotic methods to accomplish tasks related to living marine resources that will take advantage of recent advances in underwater technology. We are seeking approaches that will improve the economic viability of U.S. aquaculture industry and promote the sustainable use of our coastal and ocean resources.

Examples of tasks that are currently burdened by the high cost of underwater human presence include but are not limited to: 1) biofouling removal from aquaculture structures and net pens, 2) monitoring and sampling of the seabed within/under pen arrays, 3) shellfish harvesting, and 4) macro algae harvesting.

Techniques are sought that reduce the impact of the activity on the cultured species (in the case of aquaculture) and on non-target species and the substrate (in the case of shellfish or macro algae harvesting). Proposals should also address issues of cost of the technology compared to present costs for the same function.

8.1.15 F-E Subtopic: Aquaculture: Development of Aquaculture Siting and Environmental Management Technologies.

NOAA is going to be responsible for optimum siting of new aquaculture systems in the Exclusive Economic Zone and will be working with states for siting options in the US coastal zones. The purpose of this topic is to seek further development of ecosystem-based management models and siting criteria, and environmental monitoring technology to facilitate the siting and management of aquaculture sites. Further refinement of existing models that will help coastal managers manage nutrient flows in coastal environments is appropriate to this topic.

8.1.16 F-E Subtopic: Aquaculture: Production Systems for Marine Shellfish Aquaculture.

The purpose of this topic is to further the commercial production of mollusks through both aquaculture and wild fisheries. Proposals should be directed to all aspects of mollusk farming, hatchery production, and stock enhancement including: hatchery and grow-out methods, disease diagnostics and control, shellfish safety, nutrition and predator prevention and control.

8.1.17 F-E Subtopic: Aquaculture: The Sterilization of Marine Species for Commercial Marine Aquaculture

The escape of cultured or farmed species and their possible genetic impact on wild populations has been a continuing issue with regard to the protection of the biological diversity of the marine ecosystem and the genetic diversity of individual populations. One solution to this perceived problem is to develop non-reproducing populations of farmed fish or shellfish. Sterilization of cultured marine organisms may have some economic advantages in increasing growth, but it would definitely have the environmental advantage of conserving the genetic diversity of wild populations. The purpose of this topic is to focus research on ways to sterilize marine species for marine aquaculture applications. Proposals directed to commercially valuable marine fish and shellfish are appropriate for this topic.

8.2 TOPIC: CLIMATE

8.2.1 R-C Subtopic: A Compact, Light-weight, W-band Radar Design for Use in Airborne Cloud Studies Over Remote Locales Moran ESRL

While NOAA has made considerable progress in the last decade in improving the forecast of hurricane tracks, the skill of forecasts of hurricane changes in intensity have not improved. Rapid intensification of hurricanes (e.g., hurricane Kartrina) represents a huge threat of the US coast. Recent modeling studies

(Fairall et al., 1994; Andreas and Emanuel 2001) have shown that sea spray can profoundly affect the partition of air-sea fluxes at very strong winds which, in turn, changes the intensity of the hurricane. This is now believed to be the single most important physical process not realized in today's hurricane models. While modeling efforts continue, this line of research is now on hold because of a lack of observations of sea spray profiles in hurricanes. In situ sensors deployed on aircraft of surface platforms are just not practical approaches to obtaining the necessary observations. Thus, an airborne remote sensing capability is required. Cloud radars that operate at millimeter wavelengths are a fundamental tool used in observing most precipitating and non-precipitating clouds as well as sea spray and play a vital role in many field programs world wide. A clear benefit to using a cloud radar operating in the W-band (94 GHz) is that the small wavelength (3mm) can produce a very sensitive radar with a very compact mechanical design.

One critical piece of technology needed to deploy a W-band radar is a smart, low power, light weight scanning platform capable of withstanding the environments typical of airborne platforms such as the NOAA P3 or the NOAA/NASA Altair UAV aircraft. Such a platform is available through a NOAA partnership between the NOAA ESRL Physical Science Division and The University of Colorado's Center for Environmental Technology. The major components for the radar electronics' system will be provided by NOAA and CET will provide the lightweight scan head suitable for use on the air platforms. A third party design is needed that will use the available RF electronics and incorporate them into the scan head to provide dual polarization scanning capability and data processing of raw spectral data from the moving platform. The design should be capable of flying in either the P3 aircraft, which is pressurized or a more demanding environment of the un-pressurized Altair UAV. The recent use of a W-band klystron tube in the NASA CloudSat program has made available a general purpose amplifier tube capable of providing reliable RF power for the transmitter. The current transmitter power supply and radar electronics design will need to be evaluated so as to fit the airborne requirements. What is presently needed is a quality design that integrates the NOAA electronics, the CET's scan head and the suppliers data system. We request a Phase 1 study that would provide a complete design for the airborne radar that would include evaluation of present platform requirements for the P3 and NOAA/NASA Altair UAV aircraft, concept design for the integration of the NOAA RF electronics parts into the CET scan head and final design for the data system and data collection units. The design could be based upon current working units that need special modifications to adapt to the aircraft environment.

References:

Andreas, E.L., and K.A. Emanuel, 2001: Effects of sea spray on tropical cyclone activity. J. Geophys. Res. 58, 3741-375.

Fairall, C.W., J. Kepert, and G.J. Holland, 1995: The effect of sea spray on surface energy transports over the ocean. /The Global Atmospheric Ocean System/, *2*, 121-142.

http://uav.noaa.gov/altair/index.html

Li, Lihau, and Coauthors, 2004: A 94-GHz cloud radar system on a NASA high-altitude ER-2 aircraft *J. Atmos. Oceanic Tech.*, **21**,1378-1388.

Mead J.A., Pazmany, S. Sekelsky, and R. McIntosh, 1994: Millimeter-wavelength radars for remotely sensing clouds and precipitation. *Proc. IEEE*, **82** 1891-1906.

Moran, K.P and Coauthors, 1998: An unattended cloud-profiling radar for use in climate studies. *Bull Amer. Meteor. Soc.,* **79** 443-455.

8.2.2 R-C Subtopic: New Lightweight Trace Gas Spectrometers for Climate, and the Combined Weather and Water Mission Goals

NOAA's five year plan (Research in NOAA: Toward Understanding and Predicting Earth's Environment, Five year plan, Fiscal Year 2005-2009) and 20 year Research vision: Understanding Global Ecosystems to Support Informed Decision-Making, include Unmanned Aircraft Systems (UAS) as an operational and research platform (http://www.esrl.noaa.gov/planning/). UAS fit into the NOAA Strategic Plan FY 2005 - FY 2010 by ensuring continuous observation of critical environmental conditions. The primary purpose of these aircraft platforms will be mainly operational in nature providing more vertical soundings of meteorological parameters over remote regions (Pacific) to improve NOAA's long term (3-day to 7-day) forecast. There will be limited space for lightweight in situ chemical sensors. Currently there are only a handful of chemical sensors that have flown on the NOAA UAS demonstration missions (http://uas.noaa.gov). These lightweight sensors will be needed for long-endurance (20-36 hours) and high-risk areas (polar region or oceans) UAS platforms. Trace gases play an important role in two of NOAA's goals: climate and the combined water and weather goals. Monitoring the global abundances and trends of the greenhouse gases (carbon dioxide, ozone, water vapor, methane, nitrous oxide, chlorofluorocarbons, halocarbons, perfluorocarbons, and sulfur hexafluoride) is one the elements in the climate goal. Measurements of the vertical profiles of atmospheric water vapor are crucial to weather and water mission goal. There have been recent advances in infrared and mass spectrometry to measure trace gases with lightweight sensors. The goal of this research proposal in Phase I is to design a prototype instrument that will improve the precision of the measurement of a trace gas by either using a new tunable diode laser (room temperature) or electron source or reducing the size of a major component (multi-pass cell, mass spectrometer, cryogenic trap, etc.). Phase II work will

involve building that prototype. This type of instrument has wide application use including homeland security, clinical analysis, industrial quality control and field research.

References:

Elkins, J. W. et al., Airborne gas chromatograph for in situ measurements of long-lived species in the upper troposphere and lower stratosphere, *Geophysical Research Letters*, *23* (4), 347-350, 1996.

Fahey, D. W. et al., Unmanned Aircraft Systems Achieves Demonstration Goals, *EOS,* 87 (20), 16 May 2006.

Montzka, S. A. et al., Decline in the tropospheric abundance of halogen from halocarbons: Implications for stratospheric ozone depletion., *Science*, *272*, 1318-1322, 1996.

8.2.3 C-C Subtopic: Station Keeping Drifting Data Buoy for Ocean and Meteorological Data Retrieval in Severe Marine Environments

NOAA has the need to maintain networks of ocean and meteorological environmental surveillance sensors on station in severe open ocean conditions. In days and weeks before a hurricane makes landfall, surface and subsurface environmental data about the hurricane intensity and structure are needed to improve immediate predictions and to improve forecast models. The network of moored weather buoys maintained by NOAA are not always in the correct position to provide these data. Additionally, moored buoys that are in place are sometimes damaged in a severe storm passage, and if these cannot be quickly repaired, the next storm's data are not retrieved. A requirement exists for air-deployable, real-time reporting ocean data buoys that can maintain station against wind, waves, and ocean currents, and/or can be remotely steered into a severe storm system. The buoys must be able to carry environmental sensors for collecting surface and subsurface ocean data (to 150 m depth) and surface meteorological data, and to report via satellite communications in real time. The buoys must be capable of operating through, and surviving, the center of a category 4 hurricane, and must be capable of self-propulsion and be steerable at a rate of 2 knots against tropical storm conditions (sea state 5 wind and waves) for a minimum sustained period of 72 hours. The buoy system must be deployable from a C-130 aircraft.

8.2.4 C-C Subtopic: Autonomous pCO_2 Measurement Systems for Moorings

The world's oceans take up more than 40% of the annual release of fossil fuel carbon. To pinpoint the locations of oceanic uptake, and more importantly, to

assess if this uptake will change in the future it is imperative to understand the processes responsible. In addition, the oceanic uptake together with the atmospheric growth rate and fuel emissions offers a robust constraint on terrestrial fluxes. Due to the spatial and temporal variability of terrestrial fluxes, they are particularly difficult to quantify.

The NOAA Office of Global Program's Global Carbon Cycle Program is interested in developing autonomous instruments to measure pCO_2 for use on open-ocean and coastal moorings. Potential customers include NOAA, national, and international investigators working on producing global ocean CO_2 flux maps.

Specifications for the pCO_2 systems are as follows. The system must measure surface seawater and atmospheric CO_2 concentrations every 4 hours for up to a year at a time without servicing. The system accuracy should be within 1 ppm with calibrations traceable back to WMO standards. The system should also measure atmospheric pressure with at least 0.1% accuracy and be able to interface with other commercially available instruments necessary for converting the CO_2 concentration into a flux estimate (e.g. CTD, wind sensor). The system design needs to be compact and flexible enough to be safely mounted on a wide variety of surface moorings. The system should have a satellite transmission capability so data can be transmitted back to the laboratory in near real time (~ 1 per day) from anywhere in the world. The system needs to be able to operate under a wide range of environmental conditions.

8.2.5 C-C Subtopic: Decision Support Tools for Water Resources Management

One of NOAA's main goals is to "understand climate variability and change to enhance society's ability to plan and respond." A desired outcome of the goal is enhanced public and private sector planning and decision making through better use of information about the impacts of climate variability and change on climate-sensitive decisions and sectors, such as water management, agriculture, fisheries, forests, infrastructure planning, coastal zones, and public health.

The NOAA Climate Program Office Climate Assessments and Services Division (CASD) (http://www.climate.noaa.gov/cpo_pa/) stimulates and supports research and applications activities designed to link climate science to society in order to expand regional adaptive capacity in the face of climate change and variability. Specifically, CASD seeks to: identify, explore and communicate the information needs of a diverse suite of decision-makers in order to foster a solution-oriented focus to NOAA research and services; identify, understand & assess the sensitivity and adaptability of managed systems to climate; explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change; and catalyze and accelerate the development, prototyping and evaluation of tools and methods for productively

connecting science to decision-making needs and structures. The use of climate information for resource management and infrastructure planning is an important focus of several CASD programs, including Regional Integrated Sciences and Assessments (RISA) (see http://www.climate.noaa.gov/cpo_pa/risa/), Sector Applications and Research Program (see http://www.climate.noaa.gov/cpo_pa/sarp/), and Transition of Research Applications to Climate Services (TRACS) Program (formerly NOAA Climate Transition Program (NCTP))(see http://www.climate.noaa.gov/cpo_pa/Nctp/. The RISA teams (currently 8 across the U.S.), in particular, have been developing models, tools, and information for use in the water resources management area.

The objective of this subtopic is to stimulate the development of applications related to water resources and hydrology that make use of climate-time-scale datasets or probabilistic hydrologic forecasts. The Climate Program is interested in considering proposals in which climate forecasts and outlooks longer than 2 weeks into seasons and years can be used to produce probabilistic hydrologic forecasts that can be applied to water resources applications, particularly related to drought. Examples of applications would be basin- to regional-scale high-resolution (~1km) soil moisture forecasts that can be applied by, for instance, irrigation managers in crop selection, water banking, and/or drought management; strategic reservoir operations planning that allows the substitution of fixed reservoir operating rules by probabilistic real-time reservoir operations of single- or multiple-purpose reservoirs or basin-scale management activities. The offeror is urged to the extent that it is possible to leverage work undertaken under the TRACS Program.

Phase I should focus on exploration and the initial phase of development of the decision support tool. Phase II should focus on full development of the tool and mechanisms for commercialization of the product.

8.2.6 C-C Subtopic: Education/Awareness DVDs/Videos

The NOAA 2006-2011 Strategic Plan Climate Mission Goal Outcome states: Climate-sensitive sectors and the climate-literate public effectively incorporating NOAA's climate products into their plans and decisions with a Strategy: to support educational efforts to create a more climate-literate public by developing climate educational materials, involving teachers in the research process, and generating tools to allow climate information to be used in decision-making.

A Cross-cutting Priority in the Strategic Plan, is Promoting Environmental Literacy: As a global leader in oceanic and atmospheric sciences, NOAA has a responsibility to improve public understanding of our planet's dynamic air and water systems and the effect those systems have on all aspects of people's lives. NOAA works with partners in educational institutions and organizations, government agencies at all levels, and private industry to build environmental literacy. NOAA seeks to educate and inform present and future generations

about the changing Earth and its processes, to inspire youth to pursue scientific and technical careers, and to improve the public's awareness, understanding, and use of NOAA products and services. NOAA accomplishes this through a multitude of activities that represent a continuum from outreach to formal and informal education (http://www.oesd.noaa.gov/NOAA_Ed_Plan.pdf). The result is a public better able to make informed decisions and take appropriate action on environmental and ecological matters.

The objective of this subtopic is to develop an innovative series of DVDs and/or videos for classroom education on climate variability and change. These products should include NOAA research on the science of climate variability, effects on ecosystems, impacts on human systems, and on historic and contemporary adaptations to the challenges of climate impacts. The DVDs/videos must be based on National Science Education Standards (http://www.nap.edu/readingroom/books/nses/) and the AAAS Project 2061 Benchmarks for Science Literacy (http://www.project2061.org/publications/bsl/default.htm?nav)

Phase I should focus on exploration and the initial phase of development of the DVDs/videos exploring topics, content, required footage, etc. Phase II should focus on full development of the products. The offeror is urged, to the maximum extent possible, to collaborate with staff at the NOAA Climate Program Office to leverage materials from the FY2006 educational activities:

- AAAS Project 2061 Atlas of Science Literacy: volume 2, Chapter 4: The Physical Setting, Weather & Climate (http://www.project2061.org/publications/atlas/vol2/4b_climate.pdf)
- 2006 NOAA Education Mini Grant "DEVELOPING A FRAMEWORK FOR CLIMATE & WEATHER EDUCATION: BUILDING FROM AAAS PROJECT 2061'S ATLAS OF CLIMATE & WEATHER SCIENCE LITERACY" in the phase I and II.

8.2.7 C-C Subtopic: Climate Curriculum Education Module

The NOAA 2006-2011 Strategic Plan Climate Mission Goal Outcome states: Climate-sensitive sectors and the climate-literate public effectively incorporating NOAA's climate products into their plans and decisions with a Strategy: to support educational efforts to create a more climate-literate public by developing climate educational materials, involving teachers in the research process, and generating tools to allow climate information to be used in decision-making.

A Cross-cutting Priority in the Strategic Plan, is Promoting Environmental Literacy: As a global leader in oceanic and atmospheric sciences, NOAA has a responsibility to improve public understanding of our planet's dynamic air and water systems and the effect those systems have on all aspects of people's lives. NOAA works with partners in educational institutions and organizations, government agencies at all levels, and private industry to build environmental

literacy. NOAA seeks to educate and inform present and future generations about the changing Earth and its processes, to inspire youth to pursue scientific and technical careers, and to improve the public's awareness, understanding, and use of NOAA products and services. NOAA accomplishes this through a multitude of activities that represent a continuum from outreach to formal and informal education (http://www.oesd.noaa.gov/NOAA_Ed_Plan.pdf). The result is a public better able to make informed decisions and take appropriate action on environmental and ecological matters.

The objective of this subtopic is to develop an innovative curriculum/book with lesson plans for classroom education on climate variability and change. The products should include NOAA research on the science of climate variability, effects on ecosystems, impact on human systems, and on historic and contemporary adaptations to the challenges of climate impacts. The curriculum must be based on National Science Education Standards (http://www.nap.edu/readingroom/books/nses/) and the AAAS Project 2061 Benchmarks for Science Literacy (http://www.project2061.org/publications/bsl/default.htm?nav) The curriculum module should also use an Earth Systems science framework.

Phase I should focus on exploration and the initial phase of development of the curriculum. Phase II should focus on full development of the curriculum/book for commercialization of the product. The offeror is urged, to the maximum extent possible, to collaborate with staff at the NOAA Climate Program Office to leverage materials from the FY2006 educational activities:

- AAAS Project 2061 Atlas of Science Literacy: volume 2, Chapter 4: The Physical Setting, Weather & Climate (http://www.project2061.org/publications/atlas/vol2/4b_climate.pdf)
- 2006 NOAA Education Mini Grant "DEVELOPING A FRAMEWORK FOR CLIMATE & WEATHER EDUCATION: BUILDING FROM AAAS PROJECT 2061'S ATLAS OF CLIMATE & WEATHER SCIENCE LITERACY" in the phase I and II.

8.3 TOPIC: WEATHER AND WATER

8.3.1 W-W Subtopic: Inexpensive Threat-Resistant External Modem with Federal Information System Security Features

The security threat to non-classified, "high impact" Federal and commercial Information Technology (IT) systems is both diverse and pervasive. External interfaces intended to offer authorized remote users access to local information and system resources are of particular concern due to their constant exposure and propensity for hostile exploitation. To that end, a significant void exists in implementing an autonomous analog dial-in telecommunication device which meets the prescribed National Institute of Standards and Technology (NIST) IT

security controls for high impact systems, and functions as the interface between an external untrusted system and internal trusted systems. A compelling need exists for a small form factor (e.g., external PC modem sized) dial-in/dial-out interface device which is responsive to NIST guidelines, complies with Department of Commerce (DOC) and NWS IT Security requirements, and provides resilience to both brute force and intelligent intrusion attempts by unauthorized individuals.

Capabilities shall be consistent with NIST Guidelines, DOC & NWS Policy, and include (NOTE - these are a sample of the requirements not met by today's modem-only technology. It is not intended to be a comprehensive list of the requirements.):

* Requires valid user name and passwords to establish connection -- any locally stored passwords shall be encrypted. Recognizes up to 100 unique user names & passwords.

* Employs DOC password policy and a "3-failed-log-in attempts / 15 minute time out". Number of log in attempts and duration of time out should be selectable: 3 to 5 log-in attempts (1 attempt increments), and 10 to 90 min time-outs (5 min increments).

* In band security administration - "root", admin, and users. Assigned user names and passwords with assignable permissions for admins & users; system logs permissions; setting parameters; etc.

* Prompting admin or user for change of password 10 days in advance of 90 day expiration. Password expiration time is a "root" selectable variable from 1 to 180 days.

* Employs remote security scripting to allow automated upload of all system parameters including user name & passwords (configuration backup file) and automated downloads to restore system configurations overnight on up to 1000 separate autonomous devices from a remote dial-in connection.

* Logs remote access sessions, remote access attempts, and outbound calls. Log may be automatically or manual exported/reset by "root" and/or admins ("root" selectable parameter).

* Logs all admin activity. Log is automatically or manual exported/reset by "root" and/or admin ("root" selectable parameter).

* Back-up battery powered operation. Back-up battery recharges during normal power operations.

* All information is retained during one or more prolonged total power outages, including outage of back-up battery power.

* Allows and logs outgoing calls

* Meets NOAA Weather Radio environmental requirements.

* Operates in an active RF environment.

* Supports both machine (computer) and human (voice or tone) interface (see ROAMS)

* Employs a secure connection protocol (e.g., SSH, SFTP) for all machine interfaces.

Additional innovative technology should be employed to avoid characterizing connection as a modem, and evade unauthorized access. Examples include:

* Recognize and store trusted telephone numbers, or external modem IDs for use in verifying the caller's ID

* Use of caller ID as a method of identification as well as blocking "out of area" or other unidentified calls

* Answer call with simulated telephone ringing, with "disconnected number" tone & recording, or with "your call cannot be completed as dialed" tone and recording -- but listen for and process incoming signal for valid code(s) to cancel outgoing message and process call.

Equipment use will be limited to non-classified systems and information. Equipment and software proposed should provide an integrated solution to meeting the requirements. An open source software solution is desired. Software and firmware source code, code documentation, compilers, and the development environment shall be fully disclosed to the Government - for Government Use Only -- for verification and product IT security risk assessment.

References:

National Weather Service Instruction (NWSI) 60-704, Technical Controls, November 14, 2003.

NIST Special Publication 800-53_, Guide for Assessing the Security Controls in Federal Information Systems.

NOAA Weather Radio (NWR) Request for Proposal (RFP)

NWSI 10-1710, NOAA Weather Radio (NWR) Dissemination, October 1, 2002

U.S. Department of Commerce IT Security Program Policy and Minimum Implementation Standards, June 30, 2005

8.3.2 N-W Subtopic: Domoic Acid Detection Kit

Domoic acid is a toxin produced by blooms of a microscopic alga known as Pseudo-nitzschia. This toxin bioaccumulates in the food chain and can be found in shellfish, crabs and fish. The harmful affects of domoic acid were first recognized in a lethal outbreak in 1987 caused by tainted mussels collected on Prince Edward Island, Canada. Since that time most of the known toxic events have occurred on the U.S. west coast. Particularly hard hit are the west coast regions of the United States including Alaska. For example, in 1998 alone, high levels of toxin in razor clams in Oregon and Washington resulted in beach closures for more than a year and a half. During this time, recreational, commercial and tribal subsistence harvest of clams, valued at over $20 million annually was lost. This toxin has also been responsible for large die offs of seabirds, sea otters and sea lions along the California coast. There is concern that consumption of this toxin, even at lot levels, may cause adverse sublethal neurological effects. There is therefore need to monitor this toxin in shellfish and in the environment. Given that states have limited funds for sampling this toxin, only limited data are available on the frequency with which it occurs in the environment. One means of obtaining this information and for protecting human health is to provide a rapid, inexpensive monitoring kit that can be used by citizen monitoring groups which are well established in California, Washington and Oregon.

This SBIR is for the development of a rapid field assay kit for domoic acid at toxicologically relevant concentrations. The successful company should have demonstrated ability to detect domoic acid at regulatory or subregulatory limits (<20 ppm). The actual field detection kit should require no specialized equipment and yield a result in the field in less than one to two hours. The kit must also be capable of simultaneously detecting domoic acid at regulatory limits as well as one or two lower concentrations that would indicate potential sublethal exposures. The kit should not require extensive training and be easily used by non-technical citizen monitors. The per test cost should not exceed $10.00.

8.3.3 N-W Subtopic: Radar water Level Sensor Calibration

CO-OPS uses a frequency modulation continuous wave (FMCW) microwave radar altimeter by MIROS for bridge air gap monitoring at PORTS sites. Microwave radar gauges, including pulse radar type, have also shown promising results for water level measurements and are being considered as a candidate instrument for Global Sea Level Observation System (GLOSS). However, an accurate and reliable calibration technique has not yet been developed and

would be critical to the data quality and data assurance program, especially for water level measurement applications.

A calibration technique using either a self-calibration method integrated into the instrument or a stand alone calibration instrument/procedure is sought. For this work, focus will be on the FMCW radar gauge. Accuracy should be + 3 mm or better under typical laboratory or field operation environment and traceable to the National Institute of Standards and Technology (NIST) standard. The calibration instrument/procedure is to be used for routine sensor calibration to verify the instrument performance and to determine the instrument's offset correction.

References:

Woodworth, P.L., 2003. GLOSS Experts Workshop, Paris, MIROS SM-094 range finder (http://www.miros.no) National Institute of standards and Technology (http://www.nist.gov)

8.3.4 N-W Subtopic: In-Field Detection of Harmful Algal Bloom Toxins And/or Toxigenic Species

Methods for detecting harmful algal bloom (HAB) toxins and toxigenic species are generally laborious, time-consuming and require expensive laboratory equipment. State and federal resource managers are often required to make quick decisions to protect human health with limited data so there is a need for quick, accurate tests for toxins or HAB cells that can be used in the field. The ultimate goal is to develop methods for inexpensive, accurate, rapid, and quantitative detection of toxins in HAB cells, water, or animal tissue and toxigenic organisms specific to a given geographical region. Methods that facilitate the decision process for resource managers without meeting all of the goals will also be considered. Applicants must demonstrate prior experience developing methods for detection of HAB toxins or toxigenic species.

8.3.5 E-W Subtopic: Network-Based Airborne Doppler Radar Receiver And Processor

Severe ocean storms and hurricanes pose significant threats to the United States' coastal regions, areas prone to inland flooding and marine industries. In order to improve understanding and forecasting of these storms, NOAA deploys its heavy aircraft (Orion 54 WP-3D and Gulfstream IV) to collect high resolution observations which are necessary for validating and improving satellite products in environmentally limited conditions. Critical to these operations are the NOAA airborne radars, which provide reflectivity and Doppler measurements of the precipitation and winds within these storms. Current radar receivers / processors limit the information that can be extracted from these radar systems. With recent advances in computer processors, memory, digital signal processing and data acquisition boards, it is possible to implement wide bandwidth digital receivers

and more advanced algorithms, such as spectral analysis. These will ultimately lead to better retrieval of winds and precipitation. Unfortunately, these new data acquisition systems often require significant development, are tuned to a particular radar system, often cannot run continuously, and consume significant weight, power and space. Furthermore, they need to be placed close to the radar (difficult on an aircraft) or the analog radar signals need to be run over long distances – neither solution is desirable. Standalone communication boards, based on field programmable gate array (FPGA) technology, have been recently developed with enough processing power and memory to handle the complex signal processing required for atmospheric radars, but are not well suited because they are designed to demodulate a signal, manipulate it and then convert it back to analog form rather than provide and store products in digital format. This subtopic seeks development of a low-cost, novel, digital matched filter receiver and radar processor board that handles multiple radar signals at different intermediate frequencies; is compatible with airborne platforms; and implements Pulse-Pair processing, spectral processing and clutter mitigation. In addition, this board must operate as a network device such that all products are sent and communications are performed over a network connection (IEEE 802.3).

References:

Esteban-Fernandez, D., E.M. Kerr, A. Castells, J.R. Carswell, S.J. Frasier, P.S. Chang, P.G. Black, and F.D. Marks, 2005. "IWRAP: The Imaging Wind and Rain Airborne Profiler for Remote Sensing of the Ocean and the Atmospheric Boundary Layer within Tropical Cyclones," IEEE Transactions on Geoscience and Remote Sensing, Vol. 43, No. 8, pp. 1775-1787.

NOAA Aircraft Operations Center: http://www.aoc.noaa.gov/

8.3.6 R-W Subtopic: Inexpensive Fast Response Continuous Analyzer for Atmospheric Tracers

For many years, mathematical and computer models of atmospheric transport and diffusion have been based on and verified with information gained through atmospheric tracer experiments. These involve the release of a small amount of a non-toxic, stable and easily detectable tracer gas and measuring its concentration at multiple locations while it is transported away from the release by the atmosphere. Sulfur hexafluoride (SF_6) is the most commonly used tracer gas. In recent years, computer models have increased significantly in both temporal and spacial resolution. To verify these models, high frequency concentration measurements are needed at a large number of points. This is particularly true in complex urban environments where winds vary greatly over small distances. High temporal and spatial resolution of measurements becomes essential when simulating the release of toxic chemical or biological agents

which is a primary Homeland Security concern. Since momentary exposure to high concentrations of a toxic gas may prove deadly, the measurements of atmospheric transport of these releases must be able to resolve the rapid concentration fluctuations. Instrumentation to measure concentrations at the required frequencies has been available since the 1980's. However, the instruments are expensive to manufacture and operate, essentially requiring continuous monitoring by a trained operator. This makes it impractical to field enough instruments to provide the spatial resolution that will meet the current needs. We request a Phase I study to demonstrate a practical design for an instrument with these characteristics:

1. Capable of measuring SF_6 concentration every 5 seconds or more frequently.
2. May be produced for $4,000 or less.
3. Capable of unattended operation in a field study (outdoor environment).
4. Capable of operation in a moving automobile.
5. Limit of detection of 1 part per billion or less for SF_6.
6. Practical to set up and take down quickly for studies of limited duration.

References:

Benner, R.L., and B. Lamb, 1985: A Fast Response Continuous Analyzer for Halogenated Atmospheric Tracers. J. Atmos. Oceanic Technol., 2:582-589.

8.3.7 R-W Subtopic: Inexpensive Airborne Remote Sensor for Improved Hurricane Surface Wind Structure Measurement and Prediction

NOAA Hurricane Research Division (HRD) has as one of its goals in support of the National Hurricane Center/Tropical Prediction Center (NHC/TPC) and the Environmental Modeling Center (EMC) to reduce the uncertainty in airborne real-time surface wind measurements in hurricanes by 5 % over recent improvements. In order to accomplish this, HRD seeks new, low cost, passive airborne remote sensing technology to expand the aerial coverage of measured hurricane winds at the sea surface in the presence of heavy rain beneath the aircraft from the present one kilometer (km) cross –track range to at least 10 km cross-track range, and in addition seeks to add wind direction finding capability to allow for derived parameter capability needed for initialization and validation functions in the new Hurricane weather Research and Forecasting (HWRF) coupled dynamical model being brought on line during 2006-2007. Over the past three years HRD has delivered to NHC/TPC and EMC of real time airborne Stepped Frequency Microwave Radiometer (SFMR) continuous observations of surface wind speeds beneath the flight track from NOAA WP-3D reconnaissance aircraft (Uhlhorn and Black, 2003; Jiang, et al., 2006). This technology is being transitioned to the Air Force Reserve Command 53rd Weather Reconnaissance

Squadron WC-130J aircraft in time for the delivery of routine SFMR surface wind speed measurements on every tasked reconnaissance mission in 2007. In addition, HRD has provided in the last year the delivery of operational, three-dimensional Doppler wind fields throughout the inner core of the hurricane from 1-12 km, with enhanced capability to 500 m directly below the aircraft track. The reduction of uncertainty for surface wind estimates from these two innovations- direct measurements at the surface vs. estimates from flight level as well as expanded aerial coverage through the hurricane inner core at the top of the hurricane boundary layer- has reduced surface wind uncertainty estimates by almost 10% from the estimated 20% previously. Further reduction in uncertainty of observed and forecasted hurricane peak wind, radius of hurricane force winds (64 kt), radius of storm force winds (50 kt) and radius of gale force winds (33 kt) by quadrant can be achieved by increasing the aerial coverage of surface wind observations, eliminating the need for error-containing estimates from flight level or the top of the boundary layer.

Efforts are currently under way to use active and passive remote sensing technology to achieve this purpose. The former is already underway for the NOAA WP-3D aircraft using a mix of active airborne Doppler radar systems: the conically horizontal scanning Tail Doppler radar (Gamache, et al., 2006; Black, et al., 2006) and vertical scanning Integrated Wind and Rain Profiling radar systems (Fernandez et al., 2005). A low cost passive remote sensing. The solution desired should build on, but not necessarily be limited to existing SFMR technology that utilizes passive polarimetry and/or off nadir measurements that would add surface wind direction and expanded area functionality to the existing SFMR system.

This solicitation addresses NOAA's goals, as stated in its 2006 Strategic Plan (http://www.spo.noaa.gov/pdfs/STRATEGIC%20PLANS/Strategic_Plan_2006_FINAL_04282005.pdf) and Five-Year Plan (http://nrc.noaa.gov/Docs/NOAA_5-Year_Research_Plan_010605.pdf) to monitor and observe, measure and describe and assess and predict the changes in one particular natural system, i.e. the hurricane which is producing an exponential increase in economic loss along the United States coastal environment. In particular, this solicitation seeks to address NOAA's goals to serve societies needs for Weather and Water by 1) reducing loss of life, injury and damage to the economy, 2) providing better, quicker and more valuable hurricane information to support improved decision-making and 3) increase NOAA customer satisfaction with hurricane forecasts and warnings. This solicitation should help NOAA to 1) increase lead times and accuracy of hurricane forecasts and warnings, 2) improve predictability of the onset, duration and impact of gale force, storm force and hurricane force winds, 3) increase the data base of hurricane surface wind field information as the foundation for leveraging public, private and academic partnerships, 4) increase development, application and transition to operations and services of advanced science and technology, 5) reduce the uncertainty associated with hurricane

related decision-making and assessments and 6) improve environmental understanding of hurricane structure and impacts.

The Phase I effort should demonstrate the feasibility of an affordable, solid-state radiometer/polarimeter design prior to the fabrication of a complete system during Phase II. The system should operate unattended and have the capability to produce and display surface wind speed and direction swaths in real time and transmit these swaths continuously to EMC, TPC and HRD for use in a scrolling real-time display and continuous integration into the HWRF tropical cyclone intensity prediction model together with existing Doppler radar products. In addition, the system should show promise for applications to high level surveillance aircraft such as the NOAA G-IV, for Unmanned Aerial Vehicles (UAVs) and for future spaceborne satellite missions that would eventually provide global coverage of hurricane surface winds in the presence of rain.

References:

Black, P. G., E. W. Uhlhorn, J. F. Gamache, P. P. Dodge, M. D. Powell, F. D. Marks and R. M. Atlas, 2006: Synthesis of common structure features and landfall in Hurricanes Katrina and Wilma using real-time and ground-based observations. Paper P7.12, 27th Conference on Hurricanes and Tropical Meteorology, Amercian Meteorological Society, Monterey, CA, 24-28 April, 2006 (http://ams.confex.com/ams/27Hurricanes/techprogram)

Esteban-Fernandez, D., E. M. Kerr, A. Castells, J. R. Carswell. S. J. Frasier, P. S. Chang, P. G. Black and F. J. Marks, 2005: IWRAP: The imaging wind and rain profiler for remote sensing of the ocean and atmospheric boundary layers within tropical cyclones. IEEE Trans. Geosci. and Remote Sens., 43, 1775-1787.

Gamache, J. F., P. G. Black and J. F. Marks, 2006: Three-dimensional hurricane structure change prior to landfall as revealed by automated airborne Doppler analysis. Paper 11B.5, 27th Conference on Hurricanes and Tropical Meteorology, Amercian Meteorological Society, Monterey, CA, 24-28 April, 2006 (http://ams.confex.com/ams/27Hurricanes/techprogram)

Jiang, H., P. G. Black, E. Zipser, F. D. Marks and E. W. Uhlhorn, 2006: Validation of rain-rate estimation in hurricanes from the stepped frequency microwave radiometer: Algorithm correction and error analysis., J. Atmos. Sci., 63, 252-267.

Uhlhorn, E. W. and P. G. Black, 2003: Verification of remotely sensed sea surface winds in hurricanes, J. Atmos. and Oceanic Tech., 20., 99-116.

8.3.8 R-W Subtopic: Automated GPS Bistatic Radar for Application on Aircraft

The assimilation of sea surface heights and winds into ocean model and verification of the NWS wave forecast model improves their accuracy. Similarly, soil moisture is a key variable in both drought assessment and understanding the impact of the boundary layer on climate and biological processes. Also, the Earth's climate depends greatly on the extent of polar sea ice. To map ocean surface topography, winds, polar ice, and soil moisture, radiometers and radars are used because conventional in situ measurement techniques are both localized and expensive. Recent research has been performed using reflected signals of the U.S. Global Positioning System (GPS). The GPS reflected signals convey information on surface topography, roughness and dielectric properties and can be the basis for a remote sensing tool that compliments radiometers and radars. To this end a compelling need exists for an inexpensive, small, automated airborne sensor of GPS reflections with built-in processing power to perform the necessary reflectivity calculations in real time. The envisioned sensor must be similar to and compatible with the Aircraft Communications Addressing and Recording System (ACARS), which obtains and continuously downlinks data from commercial aircraft in flight. Recent avionics developments make this concept increasingly feasible. This Phase I SBIR is for the development of an airborne system with the following requirements. The antenna and receiver system must be able to receive simultaneously reflected GPS signals at various polarizations from all available satellites to provide a large swath mapping capability. To ensure a sufficient signal-to-noise ratio a high-gain multi-element antenna is desirable. The receiver must have means to perform range/doppler processing, be able to track both the C/A and P(Y) code signals, and to have a reprogrammable architecture for use with future civil positioning signals. Additionally, the design should allow internal calibration via polarization power ratio measurements. A range of integration times should be sufficient to provide surface resolution of 100-200 m at typical en route altitudes.

References:

Hajj, G. A. and C. Zuffada, 2003. Theoretical Description of a Bistatic System for Ocean Altimetry Using the GPS Signal, Radio Science, 38, 1089, doi:10.1029/2002RS002787.

Zavorotny, V. U. and A. G. Voronovich, 2000. Scattering of GPS Signals from the Ocean with Wind Remote Sensing Application, IEEE Trans. Geosci. Remote Sensing, 38, 951-964.

Zavorotny, V., D. Masters, A. Gasiewski, B. Bartram, S. Katzberg, P. Axelrad, and R. Zamora, 2003. Seasonal Polarimetric Measurements of Soil Moisture Using Ground-Based GPS Bistatic Radar, In Proc. IGARSS, 781-783.

8.3.9 R-W Subtopic: Automatic Dropsonde Release System for UAS based Weather and Climate Observations

Emerging Unmanned Aerial System (UAS) platforms have the potential to revolutionize the accuracy and reliability of hurricane and severe weather forecasting and climate observation. NOAA's UAS interests include: 1) tracking future hurricanes "from cradle to grave" by periodically releasing dropsondes into the eye wall areas from a safe altitude directly above, and 2) the Global Universal Profiling System, which uses UASs to probe the atmosphere on a regular sampling grid for the purpose of climate monitoring. What is needed is a lightweight, automated dropsonde management and release subsystem that can initialize and release sondes in a reliable manner from UASs.

Any mechanical problem with the release system occurring at flight altitude could seriously jeopardize the overall UAS mission. Extreme care must therefore be put into the reliability aspect of the overall system design. Further, as there is presently no standard for UAS airframes, a self-contained approach is encouraged that requires as little physical space as possible (beyond the size of the expendable dropsonde payload itself) and is compatible with a variety of aircraft. A typical GPS dropsonde, such as the Vaisala RD-93 or Yankee XDR-928 is approximately 4" in diameter and 12" to 16" in length, and smaller versions of these sondes are envisioned. In addition to physically managing and releasing up to 64 dropsondes, a failsafe means of activating the sonde battery and testing both the RF telemetry link and GPS signal integrity will be necessary. The candidate should have experience with dropsondes or radiosondes and their use in airborne missions. Phase I should include a detailed prototype design study with laboratory testing of critical mechanisms and procedures.

8.3.10 W-W Subtopic: Development of Open Source Initiative (OSI) Model Application Layer for Hydrologic Radio Telemetry Data

The purpose of this subtopic is to develop a technical standard known as an OSI application layer to replace the existing Automated Local Evaluation in Real Time (ALERT) format. ALERT is a de facto standard for transmitting rain and stream gage data from remote locations by VHF/UHF radio transmissions. ALERT radio gage reports are indispensable to the National Weather Service and other federal, state, and local agencies responsible for emergency planning and water resource management. Timely and accurate ALERT gage reports save lives and reduce property damage, and contribute to NOAA’s weather and water mission by improving flash flood forecasting lead times. The ALERT gage data format, however, is based on 1970’s technology that severely restricts its reliability and data content. A new, non-proprietary standard that takes advantage of newer

technologies and user requirements is needed. The creation of a non-proprietary domain OSI application layer for ALERT data will guarantee interoperability among manufacturers. This will, in turn, encourage development of new transmitters by many potential manufacturers, and enable creation of versatile and innovative hydrometeorologic hardware and software that meet the needs of today's users. Such equipment is very likely to have applications beyond hydrometeorology, including environmental protection, highway safety, and homeland security.

In 2005 NOAA issued an SBIR solicitation to develop a new ALERT protocol, and awarded a 2005 Phase I SBIR contract to Blue Water Design, Inc (BWD). BWD focused its efforts on the first 4 OSI layers (physical, link, network, and transport), and proposed a technique using non-proprietary, 4 level orthogonal direct Frequency Shift Key (FSK) encoding, raised cosine response data filtering, with a NASA standard concatenated channel code, interfaced to a standard, off-the-shelf VHF/UHF transceiver. BWD's research, however, disproved the 4 level encoding method and therefore no Phase II SBIR was proposed. The research, however, proved that a 2 level encoding method holds great promise, and research in the public domain is continuing. The research conducted by BWD and others to date, however, did not address the OSI application layer as it applies to hydrometeorologic data collection, which this solicitation seeks to independently develop. The objective is to create a viable OSI application layer that is compatible with BWD's 2 level encoding method, building upon the body of research already established in the public domain by BWD and others. The application layer specification that the SBIR awardee will propose must consider, at a minimum, what types of information should be transmitted that are not being sent in the current ALERT format, how such messages will be encoded, how frequently messages should be reported, how content errors should be identified and processed by receiving software, what ranges and resolutions of data should be transmitted, and any additional factors that will broaden the current ALERT format's functionality.

References:

ALERT Physical Layer Feasibility Study,
http://www.afws.net/supportsite/iflows/index.html

ALERT Format Introduction http://www.afws.net/supportsite/iflows/index.html

Blue Water Design New ALERT Protocol SBIR Technical Report,
http://www.afws.net/supportsite/iflows/index.html

NOAA/NWS Flood Warning Systems Manual
http://www.nws.noaa.gov/directives/sym/pd01009042curr.pdf, Appendix F, PDF page 76.

8.4 COMMERCE AND TRANSPORTATION

8.4.1 F-T Subtopic: High Fuel Cost and Need for Renewable Alternative Fuel Source

On September 26, 2005, President Bush issued a directive to the heads of executive departments and agencies to take appropriate actions to conserve natural gas, electricity, gasoline, and diesel fuel at their facilities to the maximum extent possible. One of the conservation methods suggested was to switch to non-petroleum based or alternative fuels for vehicles. NOAA embraced this mission and in April 2006, was granted an award by the Department of Energy's Federal Energy Management Program for its use of soy-based biodiesel to run the R/V Huron Explorer, a research vessel based out of Michigan. We would like to further implement this directive by using biofuels in NOAA's marine operations, and the application of biofuels has much broader application. Diesel engines, which play a dominant role in fishing vessels and boats, contribute substantially to the high cost of operating in fisheries. Fishers would benefit from a lower cost alternative fuel that could be used to reduce their costs of operation. Diesel engines have the capability to operate on a number of different fuel types. Some large processor vessels in the Pacific northwest use processed fish oil as a supplement to diesel fuels to avoid discharging waste products at sea. Coastal Alaskan fish processing communities are faced with the problem of dealing with large quantities of byproducts. For example, Unalaska/Dutch Harbor annually generates over 3.5 million gallons of fish oil as a byproduct of their fish processing activities. This oil has low commercial value and the cost of transporting it to existing markets makes it unprofitable. A local market and use for these byproducts is needed.

8.4.2 F-T Subtopic: Pollution and Environmental Hazard of Diesel Fuel

Diesel fuel is widely used in marine applications. Fish oil byproduct, recycled engine oils, and plant based oils are also possible fuel additives and substitutes for diesel fuel. They may also be a lower cost alternative to diesel fuel sold at the marina. Avoiding federal and state fuel taxes, less stringent processing requirements for nonhuman consumption, and lower cost for recycled petroleum based oils are three possibilities for developing a lower cost diesel fuel substitute. The cost of fossil fuel in the United States is at an all-time high and continues to rise. Concurrently, the demand for alternative, renewable, and cleaner energy sources is increasing. Fossils fuels are a limited resource that will eventually disappear. Research and development of renewable biofuels (e.g. biodiesel, natural gas, and ethanol) are therefore imperative. Alternative oils may also be considered to be environmentally sustainable and reduce reliance on foreign fuel suppliers. The environmental costs and risks of using diesel fuel are high, especially when transported and used around water. Accidental spills kill fish and wildlife, contaminate the water, and are costly to clean up. Diesel emissions are high in carbon monoxide, sulfur compounds, unburned hydrocarbons, and

particulates. These emissions worsen air quality, pose risks to human health, and may contribute to global warming and the greenhouse effect. Alternatives such as biodiesel can reduce these emissions by as much as 60%. Additionally, biodiesel is non-toxic and biodegradable.

We request a Phase I study to examine the feasibility, costs, and benefits of using fish oil and other waste, or biological products, as alternative fuel sources for diesel engines and generators in NOAA's marine operations such as research vessels, generators, and cold remote facilities; places like Juneau, Alaska. The idea is to look at alternative fuel sources, like the factory ships in northwestern Pacific that use fish oils for fuel and have no processing waste go over the side. Plant based or recycled engine oils, alcohol, and other products that burn in existing diesel or with slight modification would be investigated. Potentially a small (tractor/trailer size or a little larger) unit that could be moved or built on a small plot of land like a Fisheries lab, Coast Guard Station, etc. Hopefully this would be a directed refinement process for the end diesel product to be burned, rather than a step in a process for gasoline like substances. Benefit would accrue to commercial fishermen, recreational anglers, research scientists through reduced operating expenses for research vessels, U.S. Coast Guard and state and federal law enforcement costs for patrols would be reduced, merchant marine transportation and cargo vessel costs could also benefit from reduced alternative fuel prices, and cruise ship operating costs could also be reduced. A reduced cost of operation might also accrue to the terrestrial transportation industry as well as energy generation utilities. Additionally, the fuel developed should be renewable, non-toxic, less polluting, inexpensive, and locally derived.

References:

National Biodiesel Board, http://www.nbb.org/markets/mar/.

NOAA News Online, April 2006,
http://www.noaanews.noaa.gov/stories2006/s2615.htm.

US Department of Energy, Regional Biomass Energy Program,
http://www.biodieselamerica.org/files/articles/alaskafishoil_fs_3_18_02.pdf

8.4.3 N-T Subtopics: Reliable Power Supply for Coastal Ocean Observation System

Adequate power supply to NOAA coastal ocean observation systems has been an important problem for system designers and operators. Commercial electric power is either not available or unreliable at most remote sites (such as the Alaska coast, offshore Islands, and on buoys). Alkaline batteries are bulky and short in service life. Lithium batteries have high energy density, lower self discharge rate, but are expensive and require special care in handling. Harvest of solar energy is often site and weather dependent. Fuel cell technology is

relatively new and environmental friendly, but has not been applied to observation systems.

Innovative technology is sought to either provide improvements in the efficiency, safety, reliability, and cost of existing energy sources (alkaline, lithium, solar, or fuel cell) or to generate power from renewable energy sources such as waves, tides, currents and winds. Depending on the reliability and cost analysis, energy conversion equipment could be shore-based or moored. The proposed technology development should focus on one that is most promising, applicable to NOAA coastal ocean observation system(s), and adaptable to the local environment conditions. Information on power usage at typical NOAA observation sites can be found at the references listed. Yearly system service and maintenance is desirable.

References:

NOAA NWLON and PORTS network (http://www.tidesandcurrents.noaa.gov)

8210 Bubbler Gauge User's Guide, and Next Generation Water Level Measurement System. (http://www.tidesandcurrents.noaa.gov/pub.html)

8.4.4 N-T Subtopic: Sub-surface oil detection

With the growing usage of heavier crude oils and refined products, the percentage of slightly non-buoyant or neutrally buoyant oil spills increases. Such oil provides cleanup challenges different than for floating oil. Technology for detecting moving but submerged oil remains in its infancy, generally field-constructed apparatus consisting of sorbents and weights as discussed in the reference. Currently, there do not exist robust and effective ways to remotely detect subsurface oils under realistic field conditions. An ideal instrument would quantitatively record sub-surface oil and its particle size distribution as it moved past a specific location. A possible additonal feature would be the capability to transmit this information remotely to response personnel. This subtopic requests the development of an inexpensive field-deployable instrument, along with appropriate protocols, that can provide accurate, real-time or near real-time quantitative measurement of volume and droplet size of transported sub-surface oil. The instrument should require minimal training and should provide protection from surface oil contamination and marine fouling.

Reference:

Research Planning Institute. 2006. Submerged Heavy Oil Recovery Current State Analysis, Report to U.S. Coast Guard Research and Development Center, Groton, Conn.

9.0 SUBMISSION FORMS

9.1 NOAA/SBIR COVER PAGE

NOAA/SBIR SMALL BUSINESS INNOVATION RESEARCH	This firm and/or Principal Investigator ___ has ___ has not submitted proposals for essentially equivalent work under other federal program solicitations, or ___ has ___ has not received other federal awards for essentially equivalent work.

SOLICITATION NO.: NOAA 2007-1	CLOSING DATE: January 17, 2007
NAME OF SUBMITTING FIRM	
TAXPAYER IDENTIFICATION NUMBER	
DUNS NUMBER	
ADDRESS OF FIRM (INCLUDING ZIP CODE + 4)	
TITLE OF PROPOSED PROJECT	
REQUESTED AMOUNT: $	PROPOSED DURATION: Six (6) Months
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE

THE ABOVE ORGANIZATION CERTIFIES THAT:	YES	NO
1. It is a small business firm as defined on page 6.		
2. The primary employment of the principal investigator will be with the firm at the time of award and during the conduct of the research.		
3. A minimum of two-thirds of the research will be performed by this firm in Phase I.		
4. It qualifies as a socially and economically disadvantaged small business as defined on page 7.		
5. It qualifies as a woman-owned small business as defined on page 7.		
6. It will permit the government to disclose the title and technical abstract page, plus the name, address and telephone number of the corporate official if the proposal does not result in an award to parties that may be interested in contacting you for further information or possible investment.		
7. Is your business in a HUBZone? (See: http://map.sba.gov/hubzone)		

PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	CORPORATE OFFICIAL (BUSINESS)	OTHER INFORMATION
NAME (Printed)	NAME (Printed)	YEAR FIRM FOUNDED
SIGNATURE	SIGNATURE	NUMBER OF EMPLOYEES
DATE	DATE	Average Previous 12 months _____ Currently _____
TITLE	TITLE	HAS THIS PROPOSAL BEEN SUBMITTED TO ANOTHER AGENCY? Yes ☐ No ☐
TELEPHONE NO. + AREA CODE	TELEPHONE NO. + AREA CODE	IF YES, WHAT AGENCY? _____
E-MAIL (Printed)	E-MAIL (Printed)	FAX #

PROPRIETARY NOTICE

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside of the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if a funding agreement is awarded to this proposer as a result of or in connection with this submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement. This restriction does not limit the Government's right to use information contained in the data source without restriction. The data in this proposal subject to this restriction is contained on separate proprietary page(s).

9.2 NOAA/SBIR PROJECT SUMMARY FORM

NAME OF FIRM	
AMOUNT REQUESTED	
ADDRESS	PHONE # FAX # E-MAIL:
PRINCIPAL INVESTIGATOR (NAME AND TITLE)	
TITLE OF PROJECT	
SOLICITATION SUBTOPIC **NUMBER**	SOLICITATION SUBTOPIC **TITLE**
TECHNICAL ABSTRACT **(LIMIT 150 WORDS)**	
SUMMARY OF ANTICIPATED RESULTS	

9.3 NOAA/SBIR PROPOSAL SUMMARY BUDGET

FIRM:	PROPOSAL NUMBER: (Leave Blank)
PRINCIPAL INVESTIGATOR:	
	PRICE
DIRECT LABOR:	$
OVERHEAD RATE:	$
OTHER DIRECT COSTS:	$
MATERIALS:	$
GENERAL AND ADMINISTRATIVE (G&A):	$
PROFIT:	$
TOTAL PRICE PROPOSED:	$
THIS PROPOSAL IS SUBMITTED IN RESPONSE TO NOAA SBIR PROGRAM SOLICITATION 2007-1 AND REFLECTS OUR BEST ESTIMATES AS OF THIS DATE.	
_____ TYPED NAME AND TITLE	_____ SIGNATURE DATE

9.4 NOAA/SBIR BUDGET INSTRUCTIONS

The offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system. This does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be contained, as appropriate, on a budget explanation page immediately preceding the budget in the proposal.

1. Principal Investigator (PI)

The PI must be with the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, more than half of the PI's time must be spent with the small business firm during the contract performance.

2. Direct Labor

All personnel (including PI) must be listed individually, with the projected number of hours and hourly wage.

3. Overhead Rate

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable overhead rate (10-15% is average) may be requested, which will be subject to approval by NOAA. Overhead includes fixed costs not directly related to the research effort, e.g., rent, heat, light, facilities, telephones, maintenance, insurance, etc.

4. Other Direct Costs

List all other direct costs which are not described above (i.e. consultants, subcontractor, travel, and equipment purchases). Each of the above needs a detailed explanation and elaboration of its relation to the project. (Up to $4,000 may be allocated for technical and commercial assistance.)

5. Materials

The materials and supplies required for the project must be identified. There is also a need to specify type, quantity, unit cost, and total estimated cost of these materials and supplies.

6. General & Administration (G&A)

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable G&A rate may be requested, subject to approval by NOAA. G&A includes costs associated with managing and running the small business, e.g. computers, copier, marketing, charitable contributions, loans, gifts, entertainment, dues, etc.

7. Profit

The small business may request a reasonable profit. About seven percent of the costs is the average proposed.

10.0 NOAA/SBIR CHECKLIST

Please review this checklist carefully to assure that your proposal meets the NOAA requirements. Failure to meet these requirements may result in your proposal being returned without consideration. **Six copies of the proposal must be received by Noon EST January 17, 2007.**

_____ 1. The proposal is **25 PAGES OR LESS** in length.

_____ 2. The proposal is limited to only **ONE** of the subtopics in Section 8.

_____ 3. The proposal budget is for **$95,000 or LESS**.

_____ 4. The abstract contains **no proprietary information** and does **not exceed** space provided on the Project Summary.

_____ 5. The proposal contains only pages of 21.6cm X 27.9cm size (8 ½" X 11").

_____ 6. The proposal, Cover Page and Project Summary contains **an easy-to-read font (fixed pitch of 12 or fewer characters per inch or proportional font of point size 10 or larger) with no more than six lines per inch**, except as a legend on reduced drawings, but not tables.

_____ 7. The **COVER PAGE** has been completed and is **PAGE 1** of the proposal.

_____ 8. The **PROJECT SUMMARY** has been completed and is **PAGE 2** of the proposal.

_____ 9. The **TECHICAL CONTENT** of the proposal begins on **PAGE 3** and includes the items identified in **SECTION 3.3.3** of the solicitation.

_____ 10. The **SBIR PROPOSAL SUMMARY BUDGET** has been completed and is the **LAST PAGE** of the proposal.

_____ 11. The P.I. is employed by the company.

NOTE: Proposers are cautioned of unforeseen delays that can cause late arrival of proposals, with the result that they may be returned without evaluation.

11.0 SBIR NATIONAL CONFERENCES

FEDERAL R&D OPPORTUNITIES
FOR
TECHNOLOGY INTENSIVE FIRMS

Sponsored by:
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In Cooperation with
All Federal SBIR Departments and Agencies

Marketing Opportunities for R&D and Technology Projects with Federal Agencies and Major Corporations.

Techniques and Strategies for Commercializing R&D through Venture Capital, Joint Ventures, Partnering, Subcontracts, Licensing, and International Markets.

Management Seminars in Marketing and Business Planning.

Working with Academia and the States.

National Critical Technologies.

Agency and company exhibits and/or One-on-One tables will be open for networking opportunities for all attendees!

MILWAUKEE, WI NOVEMBER 6-9, 2006

For further information on this conference and upcoming 2006 conferences, see SBIR Homepage: www.sbirworld.com